THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

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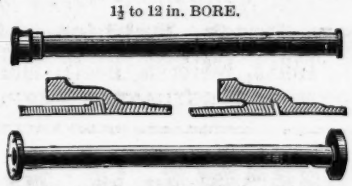

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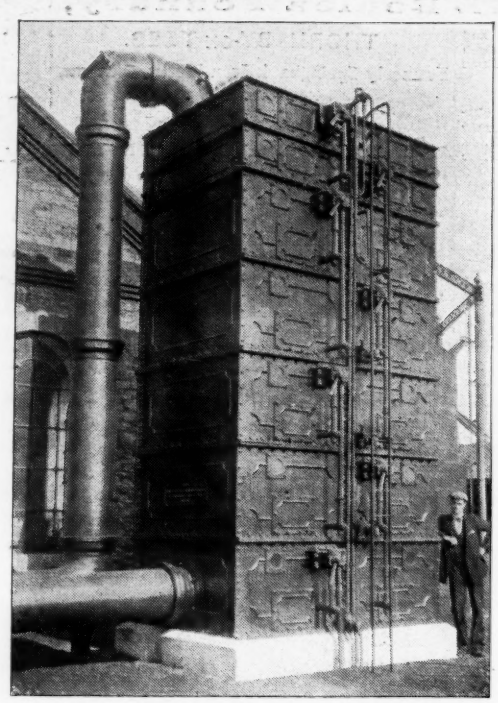

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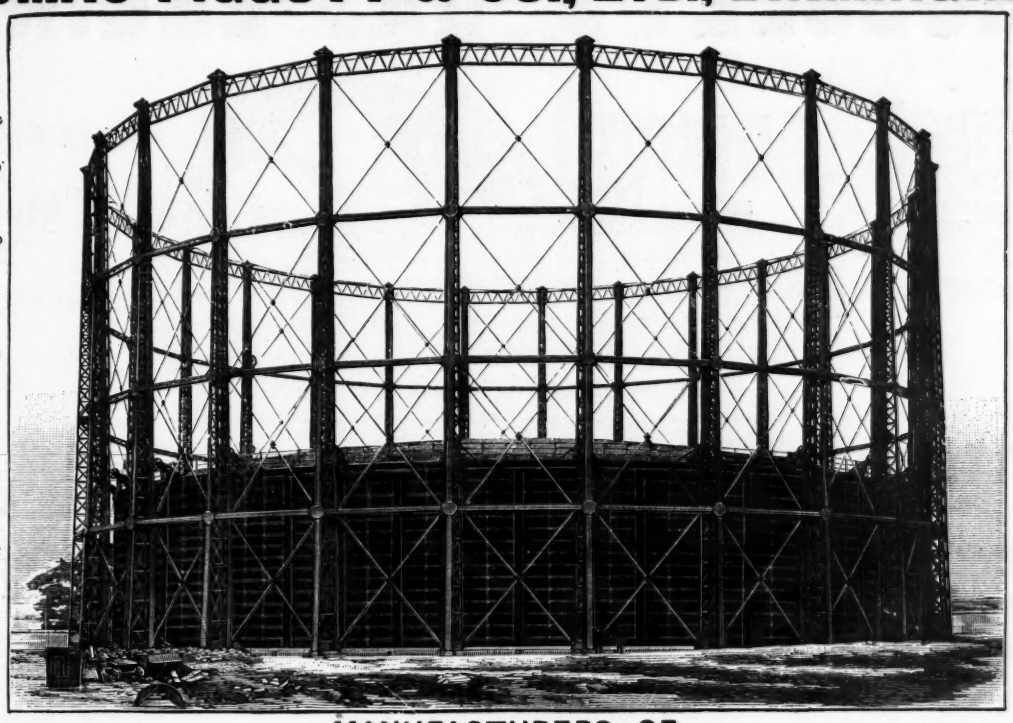

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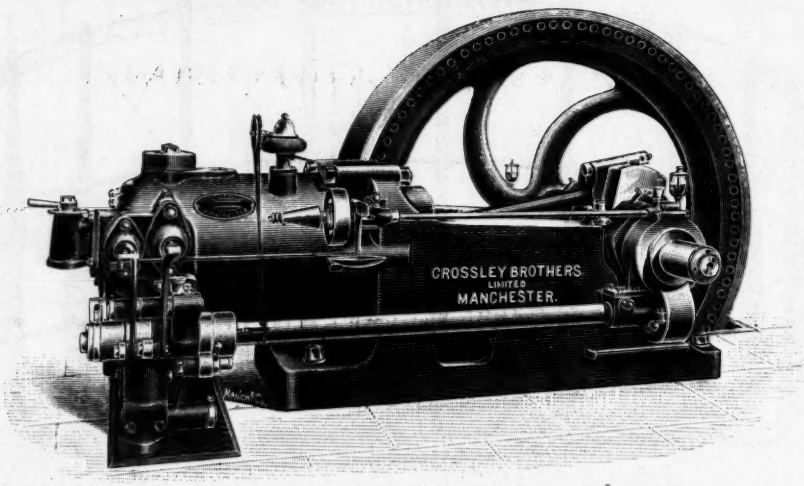

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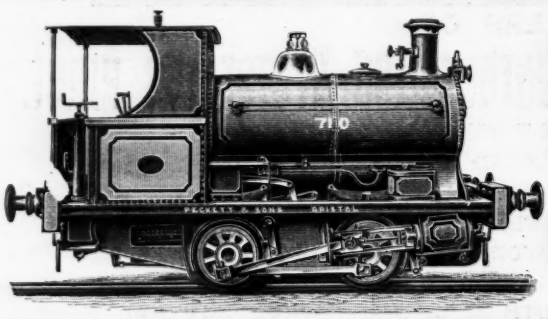

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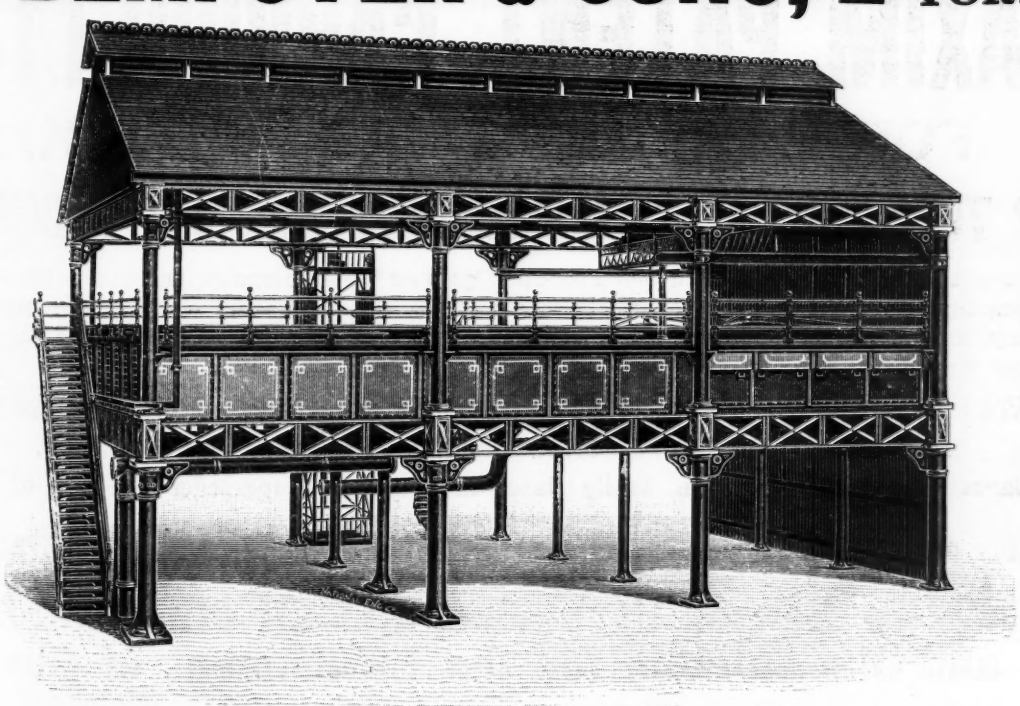

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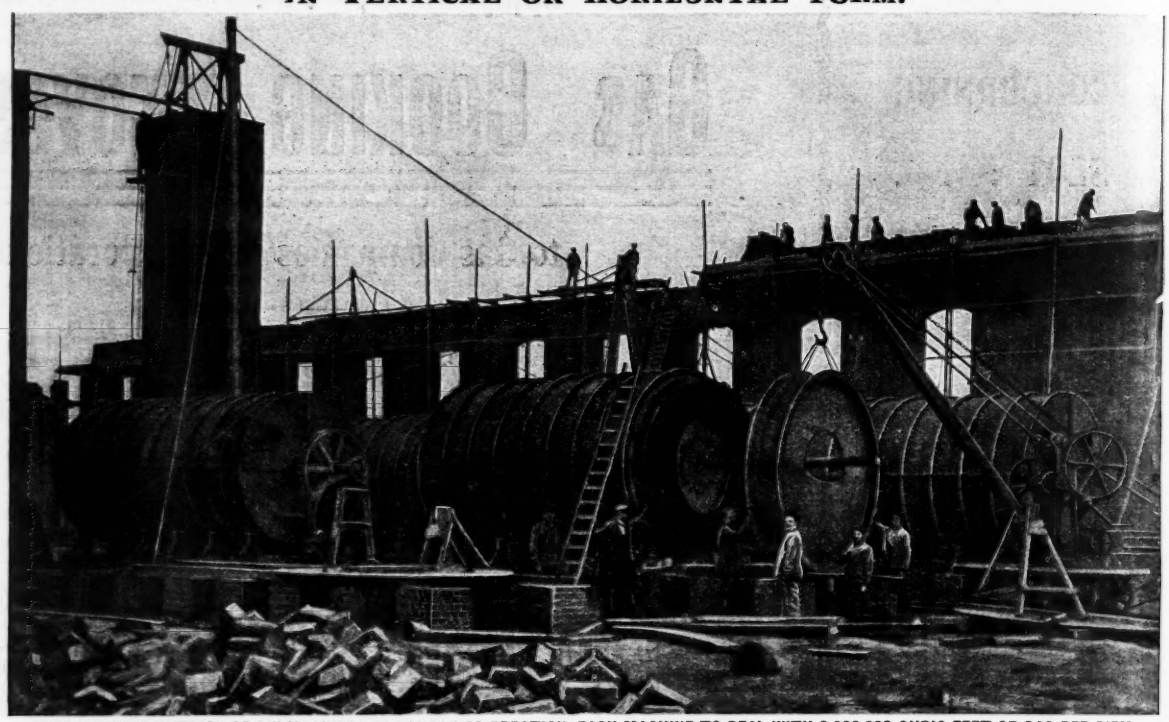

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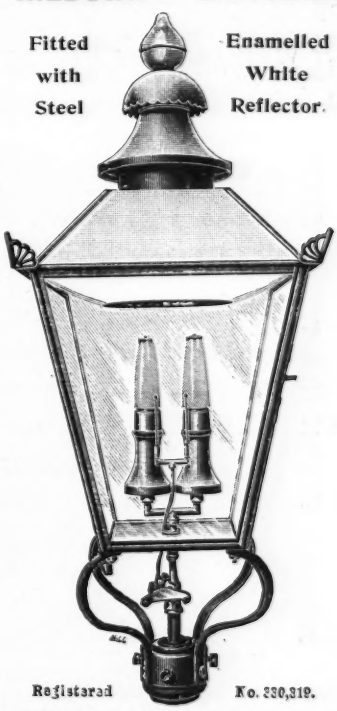
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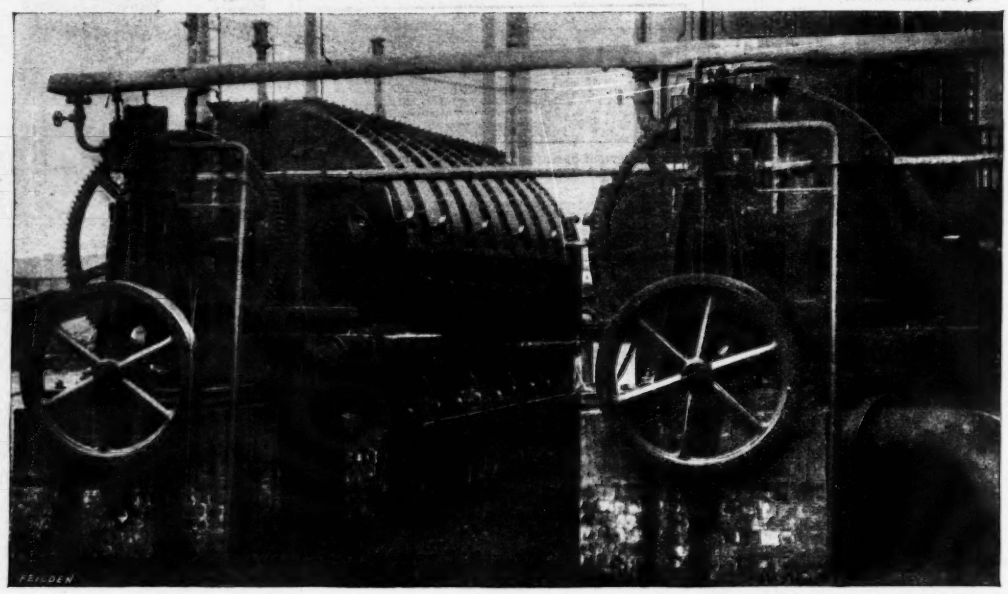

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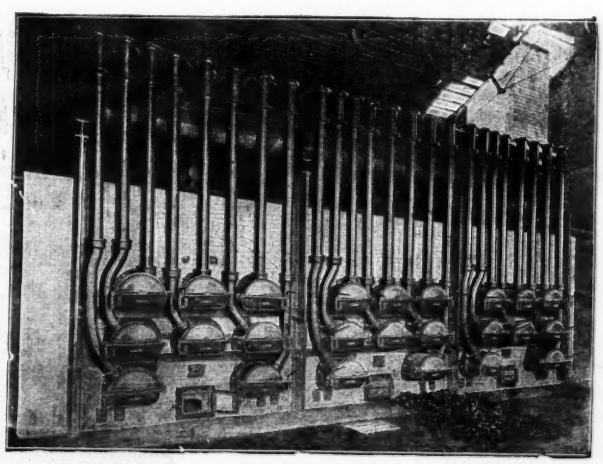

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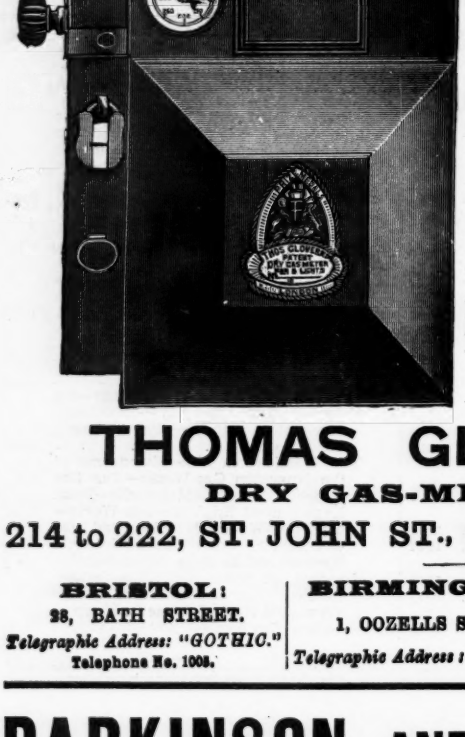

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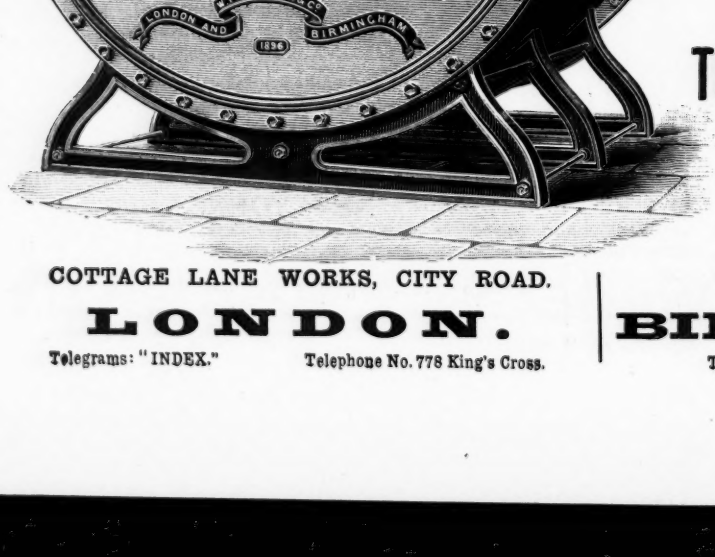

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JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

VOL. LXXVII., No. 1979.——TUESDAY, APRIL 16, 1901.

EDITORIAL NOTES.

As in 1899.

THE price of gas coal for the ensuing year may be said to be practically determined. As readers will doubtless have seen by the North of England newspapers, the South Metropolitan Gas Company have concluded contracts for a considerable portion of their annual coal requirements at prices averaging about 9s. per ton f.o.b., or as near as may be to the price paid on their 1899-1900 contracts. This is as against an average of about 16s. paid during the twelve months just ended, and, although still something like 2s. 6d. above bottom prices, will doubtless give considerable satisfaction to the shareholders and consumers of the Company, as an early fall in the price of gas south of the Thames—and in the district of the Commercial Company, who have concluded contracts on somewhat similar terms—may now be looked for. The Gaslight Company's coal year does not come to an end until June. They will undoubtedly be able to secure equally favourable terms to those obtained by their neighbours; but the date at which a reduction in the price of gas will be recorded in their district cannot, in the special circumstances of the Company, be forecast with anything like equal certainty.

This return to the prices of two years ago—which has now for some months past appeared to be a certainty, unless buyers completely lost their nerve—closes a chapter in the history of the gas industry which it is earnestly to be hoped will not be repeated for many a long day, if ever. The damage that has been done to the gas business by the almost universal raising of prices, cannot easily be computed. Not only has economy been generally practised by gas consumers during the season of high prices, but those habits of special economy (or even of disuse) will take longer to depart than they took to arrive. But this knowledge will undoubtedly inspire gas managers to special efforts to push the sale of their speciality.

The one cloud in the future prospect that may give rise to misgivings on the part of the coal consumer is caused by the probabilities of labour troubles. Two of the disturbances to which we referred last week—the strike of the engine-keepers in Lanarkshire and of the miners at Wearmouth—have fortunately been of short duration; but the spirit displayed by the men is far from pleasant. The Lanarkshire trouble collapsed through the (by the miners) unexpected action of the iron and steel masters. As soon as ever the collieries stopped working, the iron and steel works proceeded, with one accord, to shut their gates and damp down their furnaces the moment their stocks of fuel were exhausted. Instead, therefore, of their action in supporting the engine men having the effect of sending up the price of coal and keeping up their wages, the miners found that they had simply thrown idle all the trade of the district. A very few hours saw the men back at work on the employers' terms. At Wearmouth, the miners have succeeded in coercing their fellows into joining the Union, so there will be no strike there.

Another question is, however, threatening the peace in Scotland; and that is the "five days" policy adopted by the Federation. The men are by no means agreed among themselves as to the advisability of enforcing the proposal to work ten instead of eleven days per fortnight, and are hesitating about taking any decisive action. While they are doing so, however, the owners in Ayrshire have carried the war into the enemy's country by posting notices to the effect that, unless the men agree to work six days per week in future (instead of eleven per fortnight), they will be locked out. At the one colliery in the Lothians, in fact, at which the men have started the five-day system, they have promptly had the gates closed to them, with an intimation that they can resume work only on the old eleven-day plan. Moreover, wages come up again for discussion in Scotland at the end of this month; so that we shall soon see which party has the stiffest back.

The strong position taken up by the Ayrshire coalowners is due to the fact that their trade, which is almost exclusively export, has suffered heavily from the competition of the North of England ports, where prices were earlier reduced, and they know that to successfully fight this competition, they must be able to offer ready supplies at low rates. This they cannot do if their output is to be cut down while their standing charges remain untouched. The extent to which the coal export trade has fallen off during the past quarter has undoubtedly had a very material effect upon the market everywhere, and Scotland has suffered most. The coal shipment returns for the three months show (for the whole kingdom) an increase compared with last year of 235,714 tons in January, a decrease of 536,953 tons in February, and a further decrease of 478,344 tons in March—a falling off of over a million tons in the last two months. When the very serious depression in trade on the Continent, and especially in Germany—where the firm of Krupp have discharged 9000 out of 26,000 hands since October last—is taken into consideration, it will be seen that our coal exports this year must show a very material reduction, even if the Chancellor of the Exchequer does not impose a duty, as he is being urged in some quarters to do. There is, therefore, a certainty that coal will be bought this year at fairly reasonable prices; the only uncertainty that exists is as to whether the miners will allow it to be freely supplied. Time alone can settle that doubt.

Metropolitan Gas Supply Statistics.

WITH this issue of the "JOURNAL" we publish our customary summary and analysis of the accounts of the London Gas Companies for the past year. It is impossible to avoid the reflection, however, that the statements in question are no longer what they were when all the undertakings dealt with possessed common financial arrangements, and manufactured gas upon a uniform plan. Statements relating to capital are obviously affected by the circumstance that in the case of two of the Metropolitan Companies the capital has been converted; while in the case of the third Company, it remains in the original form. Naturally, therefore, it is impossible to prepare instructive statistics from such dislocated figures. It is even worse with regard to the engineering data of capital, income, expenditure, and profit reduced to the measure of the ton of coal carbonized. This used to be the most instructive table of all, as it is one most laborious to prepare. But while the statistician's labour remains, the value of the fruit of his toil is destroyed by reason of the disturbing element of the carburetted water gas manufacture. This kind of gas making is largely practised by both the Chartered and the Commercial Gas Companies, but not at all by the South Metropolitan Gas Company. Having regard to these two disturbing elements, of partial capital conversion and partial substitution of other materials for coal in carbonization, we must be content to commend our tables for what they may be actually worth. If the work of preparing them had to be begun now, it would not be worth the doing, as the accounts stand. We keep up the custom, nevertheless, for reasons which appear to be still sufficient. It seems inadvisable to discontinue a service of long standing; and many of the entries in the tables are as valid and strictly comparable as they ever were. Moreover, the time will come when, as regards capital conversion, uniformity will again reign. Then the difficulty in comparing the capital burdens of the undertakings will disappear. The other cause of lack of a common datum will still persist, and will indeed be aggravated in the near future, with the abandonment of the 16-candle standard of illuminating power south of the Thames.

Meanwhile, a few of the figures are worthy of attention. Last year London, or that part of it which is included in the areas of supply of the three Companies, paid 4¾ millions sterling for gas for private lighting alone, besides nearly a quarter-of-a-million for gas burnt in public lamps. This is in the ratio of 11 to 1, nearly, which is a low proportion for the public lighting. The Companies' revenue from all sources was £7,018,886; out of which they paid away on revenue account £5,509,848—leaving a gross profit of £1,509,038. This, after all, was under 4¼ per cent. upon the capital and borrowed money, with the Commercial Gas Company's standing at their old rates. So that consumers

can scarcely be said with truth to have been hardly done by in this respect. It is a point, at any rate, for would-be municipalizers to ponder over.

For the reason already stated, it is dangerous to make much comparative use of the data of the second table. Almost the only entry that strikes one as significant of much, in the peculiar circumstances, is the proportional cost of carbonizing labour. The regular difference of 13d. and 14d. by which the South Metropolitan gas-making wages stand below the corresponding expenditure of the other two Companies is made worse rather than better for them by the circumstance of their indulging largely in the luxury of carburetted water gas. The real meaning of this discrepancy is not a simple matter of a single term, or it would be easy to state in two words. A simple diagnosis of the evil would indicate a plain remedy; but that is not to be hoped for. Lastly, in bringing to a close what we cannot but feel to be a lame commentary upon discordant figures, we present once more our short table of carbonizing results:—

TABLE *showing the Residuals produced and Gas made per Ton of Coal and Cannel by the Metropolitan Gas Companies in the Year* 1900.

Name of Company.	Coke.	Breeze.	Tar.	Am. Liq.	Gas.
	Cwt.	Bushels.	Gallons.	Gallons.	Cub. Ft.
CHARTERED	12·42	3·62	10·02	30·54	10,043
COMMERCIAL	12·04	6·44	12·76	32·17	10,126
SOUTH METROPOLITAN .	12·35	5·14	9·38	34·07	9,860
Mean per Ton . .	12·38	4·30	9·95	31·85	9,975

Here, unfortunately for statistician and commentator, confusion is worse confounded. Still, we have obtained, with great trouble, some results of a kind. Any criticism of the figures is not possible; and it is most prudent to take the more pleasant course of complimenting the works managers of the different undertakings upon their notable feat of selling 10,000 cubic of gas or thereabouts per ton of the peculiar carbonizing material with which they were served during the heaviest working period of the year under review.

The Burden of Warrington.

BRITISH municipalities who have attained to the utmost pinnacle of the municipalizer's desire—who possess gas-works, electricity supply, and everything that the most Progressive mind can long for—are not always happy. The truth about corporation affairs is not to be ascertained from enthusiastic papers read at the meetings of scientific societies, nor one-sided magazine and newspaper articles. It can be found in the fullest measure in detailed reports of the proceedings in town council meetings on "budget" evenings, but not even then in all its bareness. There is only too often a political atmosphere in municipal council chambers, such as poisons the London County Council; and where this exists, things are seen blurred, distorted, and never as they really are. Yet there are some local authorities in the country who appear to act with sanity, and straightforwardly, as we had on a recent occasion to testify in respect of the Halifax Town Council. Even in such localities, where the one or two wise men who seem to be the extent of Nature's bounty in this regard to any single town, happen to be on the council, the practical working of the municipal institutions occasions much anxiety. A case in point is Warrington, where the Chairman of the Corporation Finance Committee (Alderman Shaw Green) has just been under the unpleasant necessity of announcing that an additional rate of 8d. in the pound must be levied to meet the current expenses of the year. Warrington is just big enough to furnish a good example of the working of very complete municipal departments; while it is not so unwieldy that the local public cannot keep an intelligent survey over the work of the Corporation Committees.

This, in brief, is the story of the Chairman of the Finance Committee, and it is in many points typical: The spending departments betrayed a deplorable tendency to largely exceed the estimated outlay—partly through laxity of control, partly because of the ever-growing demands of the community. The Alderman implored the responsible officers of the Corporation to exercise the fullest and closest vigilance over all expenditure; but obviously they cannot prevent the town from spreading, nor the people from asking for all sorts of things that cost money. For example, the Parks Committee are singled out as having overspent on every possible item; their total expenditure having been half as much again as their allowance. All very reasonable, no doubt; and the outlay gave much pleasure to the people. But this kind of thing is fatal to the framing of reliable budgets. Everywhere else there is also said to be need for greater care, and more practical economy. The last phrase goes to the core of the matter. There are many and strong influences incessantly operating to increase the flow of public money from every outlet, and nothing but an amateurish, and often perfunctory, administration to put a real check upon waste. At Warrington, the Streets Improvement Committee naturally think the time propitious for spending an excess of £700 on public street lighting by electricity. Unfortunately, as the Chairman of the Finance Committee ruefully observes, this is a heavy tax just now. Then, besides, every other spending department wants something extra—more wood paving here, more carts and men, a new steam-roller—every sort and kind of expense is rapidly on the increase. It is everywhere the same tale.

To crown all, the Warrington gas undertaking cannot provide any subsidy to help to refill the depleted coffers of the Corporation. This discovery has been a sad blow to the Finance Committee. But it, and its immediate consequence of a higher rate, will do good in the long run, if the Corporation face their responsibilities more boldly, and at the same time are sufficiently businesslike in keeping down unnecessary expenses. There are always plenty of people in every town to cry out about the times being bad, and to plead for the postponement of a day of reckoning. There will also be a certain amount of friction and petty jealousy between committees and individuals, which must mean waste of money. Certain districts and orders in the community will incessantly demand particular favours. The best check upon all this lies in tying all spending committees rigidly to the rates, and not allowing them an indirect penny of assistance from any other source. The Gas Committee of Warrington have done well by the public in refraining from increasing the price of gas on account of dearness of coal; but, of course, the extra expense of working has eaten away their normal "profit." Now they have an excellent lesson as to the way in which all this money has gone.

It seems in normal times quite natural and reasonable to take a little subsidy from the water-works, and a good deal more from the gas undertaking, and so on; and corporation spending departments are very competent to get rid of any amount of the money that is so easily come by. But sooner or later the pleasant arrangement is broken into by some unforeseen requirement. A new source of water supply has to be brought in, or a reservoir made that cannot pay for itself for many years; or, as in the case in point, the gas undertaking has to pay half as much again for its coal. These are the emergencies that test corporation finances; and the strain can only be properly carried in one way—by making all administrative expenditure fall directly upon the rates, so that the people can see what they are paying and what they are getting in return, while all the remunerative departments are maintained on a self-supporting basis.

An American Welsbach Trade-Mark Case.

IT is one of the amiable weaknesses of Englishmen to speak evil of the laws and customs of their own country, and belaud those of foreign lands, especially of such as they do not know by personal experience. A very conspicuous illustration of this national trait is to be found in the persistence with which English people who have at most a bowing acquaintance with the Patent Laws, praise the American patent system, to the detriment of the reputation of the English law of patents and trade marks. Without going deeply into this vexed question for the present, it may be conceded that the divergencies between American and English patent laws are considerable. A very striking illustration of one order of these differences has come under notice in the last number to reach us of "Progressive Age," which reports the judgment of a United States Circuit Court in an action brought by the Welsbach Light Company to restrain a colourable imitation of their trade mark. This mark consists of the catch-word "Yusea," with boxes and labels of a well-known pattern. The defendants used similar boxes and labels, and marked their mantles with the registered combination "U-C-A." The complainants urged that this was substantially a copy of their prior registered mark; and the Court decided in their favour, ordering an injunction to issue accordingly.

Several curious points arise out of this record. In the first place, it completely disposes of the popular delusion—which, however, is sure to take no heed of the fact—that the

American registration of a trade mark, like the issue of an American patent, gives a secure property to the applicant. This is no more the case under the American law than it is under the British law, notwithstanding the greater parade of prior examination, and so forth, in the former system. Registration, like patenting, has still to be made good by action in the Courts. Another consideration in respect to this particular case is that the trade mark in question would not be allowed in England at all. There is a leading case, commented upon in the "JOURNAL," in which the House of Lords refused registration for a common word, although fantastically spelt. In the light of this American Welsbach litigation, there would appear to be more in this English dictum than meets the eye at the first glance. Obviously, if one fantastic spelling is admitted to registration, another effort of the same kind cannot be ruled out; and if the registrability (to coin a word) lies in the peculiar spelling, why is not one freak of the kind as good as another? It is a little something to be thankful for that the House of Lords has saved England from this infliction. Welsbach litigation is penible enough with us; but at least the Welsbach Company and their customers are not reduced to fight over the spelling of words.

Waverley Association Meeting.

THE meeting of the Waverley Association at Innerleithen last Thursday was all but wrecked on account of the action of the President, whose strange error of judgment left them without a presiding officer and the presidential address which is the introduction to the business of all such informal meetings. His absence, on account of the distance to be travelled, can be understood; but it is inexplicable why he did not forward his address, as at the previous half-yearly meeting. In default of doing so, it was competent to him to have tendered his resignation to the meeting last autumn, when a successor would have been appointed. He will doubtless now see how far wrong he was in holding on to office if he did not intend to do something. The members of the Association were quite justified under the circumstances in withholding from him the President's Medal, as a mark of displeasure at his conduct. Had it not been for the presence —almost accidentally—of Mr. W. Carmichael Peebles, of Edinburgh, it is difficult to say how the meeting would have fared. His description of the Scott-Snell lamp was appreciated by managers who cannot afford to lay down expensive intensifying plant. There is great interest at present in the lamp; and it cannot be doubted but that the outcome of the discussion at Innerleithen will be that inquiries will be made after this modern form of gas lighting. Nothing else was talked of at the meeting; but the short discussion, with the side conversations and a very pleasant afternoon excursion, redeemed the day from the profitless position in which untoward circumstances had otherwise left it.

"Chicken-and-Champagne" Inspections.

IT is high time that a strong protest was made and put upon record against the growing abuse of the "deputation" and "Press view" system of bringing industrial novelties into public notice. We are happily in a position to be able to bring this scandal under the attention of our readers, without having to "point the moral" from anything specially connected with the gas industry, which suffers from it as much as others. It is stated in the technical journals that there was recently a semi-public exhibition of the first "Diesel" engine made in this country. The arrangements included the running of a special train (with the usual accessory comforts) from London to Manchester. When the people invited to see the show arrived on the scene, it was found, to quote the "Electrician," that the conditions "afforded little or no assistance to the expert mind in "arriving at a judgment" of the merits of the exhibit. "Possibly this may have been due to the difficulty in con-"ducting tests amidst a large and pressing crowd, composed "mainly of non-technical men." Further criticism of the arrangements would be superfluous. We all know the kind of thing. It has been overdone; and the time has now come for those who take technical business seriously to set their faces against it.

Members of local authorities, and engineers with a reputation to make or to keep, will be well advised to decline, without thanks, all invitations to "chicken-and-champagne" inspections in future. We make no claim to superior virtue, but only to a modicum of common prudence and common sense in publishing here the fact that it is the rule in the Editorial department of the "JOURNAL" to shun all such functions, or, at any rate, to judge them according to a private valuation. It is impossible to avoid making use of them sometimes, because it may happen that they provide the only opportunity likely to be offered for seeing what is going on. If those whose official or public position empowers them to set the fashion in such matters would but leave these impudent affairs—these bare-faced workings of the sprat which is to catch the mackerel—severely alone, they would soon be stopped. Let the hack newspaper men rejoice in them, and pay for them by six-line paragraphs; they are no better than an insult to every competent critic. Those whose proper business it is to take account of the progress of invention and the development of our national industries, do not need catering for by special trains and luncheons arranged by advertisement contractors. When public men talk upon platforms of the national need for improving business methods, they might spare a word of denunciation of the modern abuse of the "City" that saddles even deserving novelties with the cost of all the stock tricks of the company promoter, of which the chicken-and-champagne inspection is the most hackneyed, and should be the most "suspect."

The Prevention of Corruption Bill.

AN amended Bill has been brought into the House of Lords by Lord Alverstone for the Prevention of Corruption, which has had a mixed kind of reception in the country. The object of the measure (as explained in a long memorandum prefixed to it) is to check, by making them criminal, a large number of inequitable and illegal secret payments, all of which are dishonest, and tend to shake confidence between man and man, and to discourage honest trade and enterprise. Strictly speaking, corrupt payments are not defined by the Bill; but certain transactions are declared to be corrupt. No attempt is made to define corruption, because the thing is so protean that to define it would be impossible. For the same reason, the Courts have always declined to define fraud. The memorandum to the Bill is not only one of the longest, it is also one of the "chattiest" compositions of the kind ever published in such a form. It discusses in a familiar way different classes of "unconscionable" transactions, and is not above criticizing the Christmas-box under two aspects. The Bill itself aims at both corrupt givers and receivers of any valuable consideration; the act being declared a misdemeanour. Many actions are classified as criminal that are already recognized as illicit. Servants' tips, and acts of hospitality given in good faith as such, without ulterior motive, are exempt from the provisions of the Bill. As the memorandum admits, the main difficulty of working such an Act will consist in the scarcity of evidence; such conspiracies as it is directed against being as much of silence as of fraud. We are not at all sure that, if passed, the Act would have much useful effect.

The "Transactions" of the Institution of Gas Engineers for the past year reached us yesterday. The volume contains, as usual, the papers read at the annual meeting, held under the presidency of Mr. J. W. Helps, in May, with the discussions thereon. A description of the No. 2 retort-house at the Charlottenburg Gas-Works, by Herr A. Mueller, is given in the appendix, which also contains abstracts of a few papers published in various chemical journals. The text of the papers is amply illustrated, where necessary, by folding plates. The visit to Paris in September is noticed. The volume has been produced under the editorship of the Secretary, Mr. Thomas Cole, Assoc.M.Inst.C.E.

The Most Costly Gas.—In the course of a few remarks on the subject of helion in the current number of the "Lancet," it is pointed out that its discovery by Professor Ramsay in the gases contained in certain minerals, is not likely to be of any practical utility, inasmuch as it is the costliest of all the elements. Our medical contemporary goes on to remark that the method now being pursued for capturing helion in workable quantity, shows that its separation and concentration involve an enormous expense, and what is obtained costs about £200 per cubic foot. The same amount of money would at the present time purchase upwards of a million cubic feet of coal gas.

British Association of Water-Works Engineers.—We have received the "Transactions" of the Association for the past year. It contains reports of the proceedings at the annual general meeting, held at Cardiff in June, and at the winter meeting, held in London in December, under the presidency of Mr. Charles H. Priestley, whose portrait is given as a frontispiece. The papers read on each occasion, which were of a highly interesting character, have been fully noticed in the "JOURNAL." The other matter consists of the rules, lists of members and associates, balance-sheet, &c. The volume has been produced under the editorship of the Secretary, Mr. Percy Griffith, Assoc.M.Inst.C.E..

ESSAYS AND REVIEWS.

THE USE OF EDUCATED JUDGMENT IN DEALING WITH ENGINEERING WORK.

It is a matter of common observation among engineers, that the very last men who can usually be prevailed upon to contribute papers to technical societies are those who by their personality or their position may be supposed to have the most interesting and instructive things to say. This is really the pinch of the common difficulty experienced by secretaries of professional societies in procuring satisfactory papers. There are men who are always ready to write papers; but the productions of these too-willing volunteers are not as a rule highly esteemed by the professional world. It is the workers, not the talkers, who command audience by busy men; and they are by no means over-free with their ideas and opinions. When such men do speak, their words are generally deserving of the widest publicity; but this they do not invariably receive, because they are frequently uttered to small local assemblies. An instance in point is supplied by a remarkable paper read not long since before a technical society of the Pacific Coast by Mr. George W. Dickie, Manager of the Union Iron-Works, San Francisco, and rescued by the "Engineering Record" from the decent obscurity of the volume of Transactions in which it had been buried.

Mr. Dickie arrests attention at once with the title of his paper. It is: "On the Need of Education of the Judgment in Dealing with Technical Matters." There is a touch of universality here which makes the author kin with all engineers. The interest is quickened by the opening sentence of the paper, which plunges directly into the heart of the matter, with the statement that "of all teachable things, the education of the judgment receives the least attention, while its importance is supreme." Why, of course! Here is the very pith and marrow of the wisdom of man—the power of judgment. It is, furthermore, the crowning glory of an engineer to possess this attribute, without which all cleverness, and education, and opportunity, and experience, are of smal value. When Dr. Kennedy said in his James Forrest lecture that an engineer is a man who is continually being required to make up his mind, he only said the same thing, in different words, as Mr. Dickie.

Pursuing his theme, Mr. Dickie next permits himself to wonder mildly why no University in the whole world has a Chair of Common Sense; and he concludes that the real reason must lie in the impossibility of finding a man competent to fill such a Chair. "Men in all professions are therefore left to acquire this most important part of their education as they acquire practical experience, and in most cases with as little success." With an access of pessimism hardly to be looked for in such a quarter, the author confesses that it is only when we are nearing the end of our work that we realize how important a factor judgment is in all questions of importance that come before us in our everyday experience. It must be so. "Self-education in the matter of judgment is a life-long mental discipline." One of the most important workings of this process is very difficult to deal with, especially by men actively engaged in experimental enterprises and undertakings—that is to say, engineers. This is the tendency to self-deception in regard to the result wished for.

How powerful is the tendency to "make the wish the father to the thought;" and how unconsciously we all yield to it! How eager we are to seek for evidence in favour of what we want the result to be, and to disregard any evidence pointing the other way! "We receive as friendly that which agrees with our preconceived notions, and resist and dislike that which opposes them. In fact, the inclination we exhibit to receive and to act upon any report or opinion that harmonizes with our preconceived notions can be compared, in degree, only with the incredulity we entertain toward everything that opposes them." That is the reason the industrial world is so exposed to the irruptions of schemers and persons with set ideas, who cannot be made to listen to reason.

Dealing with the question of failures of judgment in engineering matters of everyday experience—failures which give so much unnecessary trouble and cause so much waste—Mr. Dickie first of all dwelt upon a point of contemporary practice of which a good deal has been heard in other quarters. This is the growing system, as he called it, of dispensing with the necessity for the exercise of judgment in regard to every-day engineering problems, in favour of hard-and-fast rules and regulations, framed by government and public authorities, and carried out by young officials with no personal experience of large works. He declared that engineering contractors, like himself, nowadays find it hardly possible to get moot points decided by sound judgment based on experience. "I have often tried to reason from my own experience with young inspectors of work; but that kind of reasoning is not now admissible. Printed instructions are produced, with the intimation that these must be adhered to in every particular; the inspector having no discretion in the matter."

This leads up to the question of what is the proper object of specifications and conditions of contract. Mr. Dickie finds the prevalent opinion to be that the aim and intent of the wording of a specification is solely for the protection of the interests of the party who pays. He suggests that the correct idea should be that the object of the specification and terms of contract is to secure the best work; and that as there are two parties to the contract, there are two interests equally deserving of protection. Otherwise, it will be very difficult for a works inspector to use sound judgment, even if he has it at his command. If the inspector, or the engineer, once has the idea fixed in his mind that the contractor is the natural enemy of his client, the probability is that every suggestion proffered by the contractor will be regarded by him with distrust. He will think that the contractor's sole object is to do his part as cheaply as possible; and he is further prone to esteem it to be his duty to frustrate this design. If the engineer happens to be a vain man, or a man puffed up with the sense of power, he will certainly try to render the obligations of the contractor as heavy, rather than as light, as he can. If the engineer is merely weak, of course, he will be afraid to listen to anything the contractor may seek to advance on his own behalf.

This illustrates the need of an educated judgment on the part of the engineer; and, of course, it might be the other way. The contractor may allow his self-interest to blind him to all the dictates of sound judgment; so that he will put forward something which he would be the first to condemn in a business rival. The engineering contractor, in short, needs educated judgment as well as the engineer. In no questions that can arise during the execution of an engineering work is sound judgment, based on knowledge, more needed than in the many disputes that occur respecting workmanship and materials. Here, where this impartial quality is most required, we generally find that self-interest and hard-and-fast rules interfere most with its exercise. Mr. Dickie cited an example from his own experience, which must be paralleled in that of most contractors and engineers; and as it is typical, we repeat the story. It was a case of a solid cast-iron wheel which showed a few gas bubbles across the back. The maker did not consider that the small defect was sufficient reason for condemning the casting. That was his judgment, assisted, doubtless, by a strong desire to save the cost of another casting. When the engineer for the other side saw the casting, he promptly condemned it; and no amount of argument on the part of the maker availed to alter his judgment. Here was a conflict of opinions, supported on each side by motives of interest—the maker wishing to save another casting, the engineer declining to take any risk in the matter. But in this particular case—wishing to test the foundation upon which the conflicting judgments were based—Mr. Dickie offered to let the casting go at cost price, if the purchasers chose to take the risk for the sake of the reduction. The offer was accepted; and the casting proved perfectly satisfactory in service.

Mr. Dickie declares that the whole modern system of testing and inspecting materials for works of engineering construction is based on the presumption that the faculty of judgment in an inspector is a dangerous thing, and that all excuse for its cultivation must be eliminated from his mental stock-in-trade. Yet another example was given. Mr. Dickie saw condemned and broken up a large bronze casting that had cost about £600, because the test-pieces cast at the same time showed less tensile strength than the specification required. The casting itself was perfectly sound and very tough. In fact, it was admirably suited for the purpose for which it was made; and nobody who saw it had the slightest doubt of its character. Yet, because the test-bar was required to show 55,000 lbs. tensile strength per sectional inch, and broke at 44,000 lbs., a great deal of labour and most costly material was deliberately destroyed; the inspector having no discretion to exercise. When an appeal was made to a higher authority, the formal answer came, without inspection, that "the requirements of the specification must be fulfilled."

Of course, Mr. Dickie does not condemn physical tests of materials, in themselves; but he contends that, when the results are applied without judgment, the effect may be to cause great and unnecessary loss of labour and material. They do not present the whole case, even as to the character of the material of which the test-pieces are themselves composed. It is possible to cut strips that will show the finest tests, out of plates which are practically worthless. What Mr. Dickie protests against is the pedantic use of tests of materials to destroy the very purpose which they are intended to serve. Again, lack of judgment is often manifested in a demand for unreasonably strict compliance with a specification that makes no allowance for ordinary imperfections in all workmanship, even of the most skilful hands. Mr. Dickie mentioned the example of a boiler, made to a government order, which was required to have a riveted joint at a certain place. It was considered at the works that a welded seam would make a better job (the inspector agreeing). After the work was done, the inspector discovered that the weld was $\frac{1}{32}$ of an inch thinner than the rest of the plate; this being due to the waste of heating. But the specification required the plate to be of a certain thickness; and consequently, in the end, the work was condemned and thrown away.

Which is the more worthy of respect—the specification or the work which it is partly instrumental in calling into existence? The thing produced is the only reason for the instrument being brought into existence; and when once the instrument has served its purpose, its value disappears. Yet inspectors under specifications are apt to set too much store by the wording of the instrument itself, forgetting its object and the intentions of the man who originated it. The master-workman ought to be able to control and direct everything towards the desired end, including all instruments and agencies. Where this individual mastery has

disappeared behind a system of cast-iron regulations, administered without discretion, the actual producers of tangible things to correspond with ideas expressed in our defective language, interpreted by someone perhaps better acquainted with words than with things, whose judgment has not been matured by intimate knowledge of the kind of work intended by the specification, feel how hard it is to get properly understood, and resign themselves to do many things against their better judgment, for fear lest it might be thought that their judgment was deflected by self-interest and not based upon experience.

A COMBINATION TO TEST THE WELSBACH PATENT OF '93.

A MOVEMENT is on foot which betokens the approach of something more than a ripple on the sea of incandescent mantle litigation, and readers who have not already received the information may like to be in possession of it. A few months since two articles were published in these columns which showed that, in this country, competition with the Welsbach mantle of a very positive character, and of no mean dimensions, was proceeding. Before those articles were published, the writer had personal interviews and correspondence with interested people; and the view he took from the information placed before him was that the competition was anything but what could be described as *une quantité négligeable* so far as the Welsbach Company were concerned. Time has passed since then; but the trade which was being done in mantles other than the Welsbach is still being continued, and, we have reason to believe, is being increased. In a recent action for infringement (in which the defendant was a mere hawker of mantles, and did not appear in Court to substantiate his statement of defence), Mr. Fletcher Moulton observed that the Welsbach Company had commenced actions again and again, and the defendants had gone on up to the very day of trial, and then disappeared. Some time has elapsed since the two articles referred to above were published. In them the names of certain of the competing mantles were mentioned; and the addresses where the actual business in them was being carried on were easily ascertainable. At the same addresses business is being carried on to-day; and therefore these particular traders in mantles cannot be classed in the category of vanishing vendors alluded to by Mr. Fletcher Moulton.

These traders who are engaged in an active and settled business, or are making the necessary preparations for doing so, dispute the validity of the 1893 Welsbach patent; and they smile at the idea that an undefended action against a provincial hawker, who was manifestly without substance, can be regarded as in any sense a test of validity. In their own cases, they are evidently sore at the procrastination of the Welsbach Company in bringing the question to a definite issue. We hear through them of a frequent reconnaissance on the part of the Company; but the final attack is delayed. Meanwhile, the competition is carried on; and the competitors sit and chafe under the restriction to the freedom of business engendered by uncertainty of the position. Many customers deal openly with them; many more would do so, if they could assure themselves that they were fully protected from the worry which is a possible consequence of the use of other than Welsbach mantles. But the delay of the contest and the parrying with the situation are having an effect which the Welsbach Company may not have contemplated. The deferment has given the more substantial of their opponents the opportunity of conceiving and fairly entering upon a scheme of combining their forces and finances for the big struggle which is inevitable, and must be faced sooner or later. The collection of material for an opposing case is proceeding apace; and it is pretty clear that, if nothing intervenes to cause disagreement in the coterie of mantle traders who have resolved to stand shoulder to shoulder in the fight, the Welsbach Company may soon find themselves confronted by a concerted formation which will be worthy of the strong army of legal, expert, and scientific talent which the Company have hitherto retained to meet infringers, or alleged infringers, of various grades of quality and condition. For our own part, we hope the combination will proceed and attain such strength that there may be a fair, searching, and conclusive investigation into the patent of 1893; for then the existing state of ambiguity, which has wrought no good to the Welsbach Company themselves, and has by no means acted beneficently on the gas industry, will be cleared away. Whatever the result, the position of the Welsbach proprietary cannot be worse than it is to-day, notwithstanding the brave efforts which the present directorate and officials have made, and are making, to produce a greater speed and better return from the heavily laden machinery of which they find themselves possessed.

The combination of traders in incandescent mantles and requisites to which we have referred is an actuality; but some evidence of its existence beyond this bare statement will necessarily be expected. To an extent we are under a little restraint in making use of the information within reach. If we published the names of the principal of those composing the combination, some might regard them slightingly, and contemptuously describe them as adventurers. Their names and their position in the commercial world, however, afford no criterion of the measure of support which they will receive. It must not be overlooked that there are many traders in incandescent mantles and fittings who could not stand the racket of litigation single-handed, but who no doubt would gladly—to get free trading in these commodities—subscribe to a combination formed for the purpose of fighting for liberty. Several companies, too, have been registered with the object of placing on the market one or other of the numerous inventions of mantles (some illegitimate, some perhaps otherwise) of which notice has been published in our "Register of Patents;" but the promoters have in several cases been afraid to walk abroad with their nurslings, lest their pockets should be unequal to the strain of heavy litigation expenses. Such companies will, we think, be found among the subscribers. Other companies have already boldly started business, and have actions pending against them. These, too, will find it lighter to contribute to, and fight under, the combination. And last, but by no means least, we hear that there are men of finance in the City who would find joy in the breaking down of the Welsbach monopoly. We only mention these points to show that the combination has before it, if all goes well with the scheme, a field whence to gather the necessary munitions with which to contest the Welsbach Company's right to the retention of their monopoly.

The combination is only of recent birth. Some two to three months ago, a private Syndicate was formed, under the title of the Incandescent Trade Protection Society, for the purpose of promoting a plan for effectually testing the validity of the Welsbach 1893 patent. After consulting Counsel, Solicitors, &c., and thoroughly looking into the whole question, the Society called a private meeting of interested traders. Seventy-five invitations were issued; and the attendances at the meeting numbered 65—representing 27 different firms. Pledges of support, we learn, were also received from others. The discussion disclosed a general agreement as to united action being the surest course to a conclusive issue. It appears that the first idea was to form a Union under the Trades Union Act; but Counsel's opinion was antagonistic to such a proposal, as the object of the movement did not come within the scope of a Union. The alternative was the formation of a limited liability company, with a nominal capital of £15,000, and provision for its increase should it at any time prove desirable. The scheme contemplated an Advisory Committee and a Board of Directors—all of whom were to be members of the trade. All writs, summonses, and prosecutions commenced or threatened either before or after the formation of the Company, and which referred to the infringement of the "so-called" 1893 patent, would be accepted by the Advisory Committee, considered by them, and passed on to Solicitors and Counsel to defend at the Company's expense. The opinion of the "promoter" of the Company is that one test case should be fought under the best possible conditions, and, if won, the question would be for ever settled; if lost, "the trade must bow to the inevitable." Beyond this general idea of the proposal, it would be unfair for us to go at this early stage; but let the information suffice that the details of the scheme have been evolved in collaboration with a firm of solicitors. At the meeting alluded to, it is almost needless to state, after what has been written, that the scheme was adopted, an Advisory Committee was appointed to devote attention (in conjunction with the promoter and Solicitor) to the formation of the Company; and funds were at once subscribed to meet the preliminary expenses. The Committee are pushing on with their work; and there the matter rests so far as we are concerned at present. Of course, great care will have to be exercised in order to bring the objects and purposes of the Company within the scope of the Companies Acts; but the firm of Solicitors who have received instructions in the matter appear to be well alive to the peculiarities of the case. A limited company of this kind is not by any means unique, as is witnessed by the Automobile Mutual Protection Association, Limited, which has been formed to protect the members in upholding their claims against the Maybach patent. However, the combination is a curious one; and what its future will be we cannot foretell. It may succeed in consolidating the forces opposed to the Welsbach Company; it may be wrecked in an early stage of its existence. If the former is its lot, we hope that it will result in the complete dispersion of the doubt which now exists. Outside that widely desired consummation, we have no interest whatever in the combination—to use a serviceable phrase, we simply look upon it as a means to an end.

While on this subject of incandescent mantle competition, attention may be directed to the publication in our "Register of Patents" to-day of what is practically the text of the specification of Knöfler's patent for incandescent bodies or media. This invention was noticed by Professor Lewes in the Cantor Lectures he delivered at the Society of Arts last year; and, it is interesting, at this juncture, to remind readers of his view that mantles made by such methods as those of Knöfler "are clearly developments of the Clamond hood, and not of the Auer mantle." Farther on, he made use of this remark: "The new developments of the Clamond process form as important a step in the history of incandescent gas lighting as the discoveries which gave rise to the original mantles." The publication of Knöfler's specification will revive interest in these and other significant remarks by the Professor. In the physical structure of the mantle will be found the main difference from the Welsbach, and that difference has, it is stated, a most remarkable effect upon the light-giving life of the mantle. As they are fully set forth on p. 1001, there is no necessity to specify here the constructive features of the mantle; but it is interesting to read the patentee's specification.

POWER GAS IN FRANCE: THE PIERSON SYSTEM.

THE extensive use of gas-engines supplied with "mixed" producer gases is a well-marked feature of modern industrial conditions on the Continent of Europe. Students of the technology of fuel are aware that for many years past French, Belgian, and German engineers have paid particular attention to the development of the classical method of manufacturing fuel gas in a cupola with admixture of steam, which the industrial world owes to the English inventor, Joshua Kidd. All recent text-books on fuel and its uses devote a good deal of space to this branch of the subject, though scarcely one writer goes sufficiently deeply into the reasons for this special activity of foreign followers of Kidd. Most of them are content to catalogue the different gas-producers in use; and perhaps the best list of the kind is that which is given by Mr. Bryan Donkin, in his work on "Gas, Oil, and Air Engines," 3rd edition, 1900. Even this author, however, does not write scientifically on the particular subject of the actual fuel gas manufacture, or state the reasons why it has found so great popularity in France.

The first French engineer to devote himself successfully to the production of fuel gas from the poor native coal was M. Lencauchez; and his system was taken up for power purposes by MM. Delamare-Debouteville and Malandin, the inventors of the Simplex gas-engine, which was the first gas-motor to develop large powers. It has also found favour with the French Compagnie Otto. In this system of fuel gas manufacture, there is no steam blast. An air blast is employed to assist the combustion, and a stream of water is allowed to drip over the fire-bars. Almost any grade of carbonaceous matter, such as can only by courtesy be called coal, can be gasified in this way; and this consideration was the prime cause of the success of the combined system of Lencauchez generator and Simplex engine. Sweepings from colliery tramroads, the soot from locomotive boiler tubes—anything carbonaceous that would not fuse and clog the draught—could be converted into a source of power by this means.

Next in order of time, apparently, in French gas producer practice came the Taylor, or Fichet and Heurtey apparatus for making what is called "gas mixte." In this generator, the idea was to increase the proportion of steam to air in the blast, by the addition of a recuperative superheating arrangement to counteract the cooling effect of the steam. A separate steam-boiler is necessary for the working of the Fichet and Heurtey system, which means that not the very worst class of solid fuel can be satisfactorily burnt in the process. The system is extensively employed in France. It must therefore possess advantages over the simpler Lencauchez plant sufficient to compensate for its higher cost and greater elaboration, not to say complication.

A gaseous fuel system favourably mentioned by Mr. Bryan Donkin is that of Messrs. J. & O. G. Pierson, of Paris. It is mentioned that an essential character of the Pierson system is the thorough purification of the gas. This observation suggests a whole order of practical considerations not previously disclosed. Mr. Donkin says: "The makers consider it undesirable, on the score of economy, to restrict the number of purifiers, and admit a gas which is not perfectly cleansed into an engine cylinder. The same care should be exercised in this respect with producer gas as with lighting gas, and the generator should form an essential part of the gas-engine." This remarkable statement is calculated to increase the interest of gas engineers in the Pierson process; for it is often said (more or less carelessly by people who complain of the price of common coal gas) that a much less carefully purified article will answer the purpose of power generation equally well.

In view of this important feature of the Pierson power-gas process, we have obtained from the firm, who are the Paris agents for and manufacturers of Crossley gas-engines, the latest information relating to the progress of their special combined gas and power plant. We learn incidentally that Messrs. Pierson are doing an increasing trade with gas companies in the Mediterranean countries, in supplying them with fuel-gas producers, and engines, to work with coke, for running electric lighting and power branches. The firm maintain that this latter combination is excellent business, for the simple reason that thus the cheapest possible power can be obtained from the coke made on the spot; while the coke market will be regulated in accordance with the improved demand. The Gas Company at Tunis will set the example of this novel enterprise.

In the case of a Pierson gas-power plant installed for the service of the electric tramway at Cassel, near Dunkirk, an exhaustive series of tests was recently made by Professor Aimé Witz, of Lille, whose report has been furnished to us by Messrs. Pierson. This installation comprises two boilers, two gas producers, scrubber and purifiers, and one gasholder. The second boiler and producer are in reserve. The coke-scrubber is supplied with a stream of water which has to be pumped up to the tank. The air is blown into the producers by means of injectors permitting of independent regulation at will of the deliveries of steam and air, in order to assure the constancy of the composition of the gas irrespective of the consumption. The arrangement works regeneratively; and the plant is fitted with various attachments permitting of the proper surveillance of the operations at any moment. All this part of the apparatus has been thoroughly worked out. The power plant consists of three Crossley gas-engines of 26 to 31 effective horse-power. The only consumption of water being for the steam blast and to cool the engine cylinders, besides the small quantity required for the scrubber, it is possible to put down this plant at a spot where scarcity of water prevents the employment of steam power.

The electrical part of the equipment comprises two dynamos (one being reserve), which send their current through a battery of accumulators. When the traffic is little or nothing, the accumulators absorb the current, giving it off again when called upon. This compensation is automatic; so that the gas-engines have only to run continuously at a regular speed, which is the condition that best suits their economy. The tramway has a very irregular profile, with a considerable total rise between the railway station and the town. But the speed of the cars does not vary, and is independent of the interference of the conductor. The service appears to be an admirable one, and must be a great boon to the neighbourhood. Messrs. Pierson carried out their contract so well that the Company did not wait for the report of Professor Witz to express their satisfaction with the job as a whole.

The guaranteed fuel consumption was a maximum of 800 grammes (1·76 lbs.) of dry coal per effective horse-power-hour, without any deduction except for humidity, provided that there was not more than 10 per cent. of ash in the coal. The boiler fuel was to be included in this figure, and no account was to be taken of the fuel used in pumping water. Professor Witz instituted a thorough test to verify the given guarantee; and his report contains a mass of data bearing upon the working of the tramcars, which are of no special interest for us. He also testified that the gas made kept a very constant calorific value, averaging 1243 calories per cubic metre (140·5 British thermal units per cubic foot). The fuel burnt was Lagrange d'Anzin slack, containing nearly 10 per cent. of ash and 1 per cent. of humidity. The trial started with the producer in the normal working condition, after clinkering, and was left in the same state after the conclusion of the six-hour test. The boiler was fired with small coal sifted out of the slack, mixed with cinders picked out from the ashes of the producer. The total consumption in the six hours was 146·5 kilos. of slack in the producer, and 57 kilos. of small in the boiler furnace. Taking account of the power actually developed by the engines during the whole six hours, and absorbed by an electrolyzing bath, it resulted that the total fuel consumption per actual horse power per hour was no more than 659 grammes (1·23 lbs.). The guarantee given by the makers was therefore amply covered. The consumption of water was after the rate of 37·6 kilos. per hour. The producers can be damped down for 14 hours, and restored in working order by a short blast of air.

Professor Witz does not mention further the purification of the power gas; but in a pamphlet issued by Messrs. Pierson relating to their producer, it is particularly referred to as one of the points to be regarded. It is asserted that the point is of great importance in respect to applications of motive power, if disappointment is to be avoided. Otherwise there will be serious trouble through the rapid choking of the parts of the motors, which will also deteriorate if used with dirty gas. This purification is assured by the employment of a gas condenser of large area, with hydraulic seal; also by the use of a wet coke scrubber so as to arrest dust, ammonia, and all noxious gases soluble in water; and, lastly, of dry lime purifying boxes of ample area. In this way, and thus alone, can a perfectly pure gas be made for delivery into the gasholder, which itself is of considerable size. The firm declare that a long experience of gas producers, with much exact and repeated experimenting, has brought them to the conviction that it is necessary to treat the production of fuel gas by means of the same types of purifying apparatus as are employed in the manufacture of coal gas, and this without regard to the saving of cost to be effected by suppressing the most essential of these elements, or unduly reducing their size, as many makers of such apparatus are prone to do. Messrs. Pierson assert that this saving is not economical in the long run. They base themselves upon the principle that (bituminous) coal, in being subjected to gasification in the producer, makes sensibly the same bye-products and noxious gases as those resulting from coal gas manufacture. The proportions of the products are different, of course, having regard to the larger volume of producer gas and the special conditions attending its creation, as compared with the distilling of coal in retorts. But essentially there is the same fruit of the coal. Practice, oft-repeated, has confirmed this hypothesis. Wherefore Messrs. Pierson make their apparatus accordingly, and obtain a gas of excellent quality. This gas, deprived of all its impurities, is brought down to the ordinary atmospheric temperature, and stored in bulk sufficient to neutralize all transient irregularities of manufacture. Thus the result is obtained which is certain to prove satisfactory. Besides, the whole apparatus and the connections are designed on the scale of an easy working, so as to allow the gas ample time to cool, and purify, and generally do itself justice. It is admitted that the calorific power of the gas is only as 1 : 4·5 in comparison with common coal gas, and that a gas-engine supplied with this gas will only develop 75 to 90 per cent. of the power it would yield from coal gas. It is also confessed that the producer works best with coke or anthracite. The latter kind of fuel is, however, almost out of the question on the Continent. The poor, dry coals of the French measures are quite suitable for this use, at the price.

The economics of "poor gas" are thus summed up by Messrs. Pierson: With 1 kilo. of combustible, it is possible to make 4 cubic metres of gas. Owing to the presence of nitrogen, the gas is very

poor; and it takes from 4 to 5 cubic metres of it to yield the same number of calories as are carried by 1 cubic metre of coal gas. Yet, with coal costing 20 frs. per tonne, 1 cubic metre of poor gas can be made on the spot for about 2 to 2½ centimes. The chief recommendation of poor gas is that, whereas the dear and poor French coal answers well in the producer, it does not steam so economically. This is a point which even Messrs. Pierson overlook. French steam practice has never been good, for a variety of reasons; and the gas-producer consequently beats the steam-boiler far more easily than it can do the same thing in England or in America. We are quite prepared to grant to Messrs. Pierson the position of first practitioners in the gasification of dirty, semi-bituminous French coal, the gas from which requires to be purified like coal gas. Obviously, however, where a perfectly pure anthracite can be obtained at the same price, a simpler apparatus (such as the Dowson) will be equally effective.

ELECTRIC LIGHTING MEMORANDA.

A Question of Etiquette—Electricians and Gas Companies—In the Interest of Public Safety—Electricity Supply at Hastings.

It is not often that the "Journal" disagrees on questions of principle with the best technical periodicals devoted to the electrical industries. Business is business, of course; and it has never been a foible of ours to make pretence of impartiality in dealing with affairs in which the interests of the gas industry appeared to be affected. We have, on the contrary, always carefully proclaimed the nature of the *locus standi* which we assert as a public print chronicling and commenting upon matters of permanent or passing interest for the great national industry by which we live. Consequently, it has often been our journalistic experience to take opposite sides to the electrical periodicals in the way of advocacy. But, as a rule, there is much more held in common by professional writers who can claim to be engineers first, and specialists afterwards, than there is to divide them. Therefore, there have never been so many, or such profound, differences between the "Journal" and the "Electrical Review," or the "Electrician," as there is, say, between either of the latter and the trashy scribblers on matters electrical in some trumpery periodicals which profess to cater for similar interests.

All of which exordium is necessary to prelude a strong protest that must be made against the extraordinary performance of the "Electrical Review" of the 5th inst., in attacking the good faith and loyalty to his cloth of the President of the Institution of Electrical Engineers for giving evidence on behalf of the Sheffield Gas Company, and against the electrical advisers of the Corporation, on the question of electrolysis. Our readers have been kept informed of the particular development of the question that is here referred to. There was nothing out of the way in the action taken by the Sheffield Gas Company; for which, indeed, it was possible to show both statutory precedent and positive evidence of need. In order to support their case, the Gas Company retained, as they were perfectly free to do, two of the few eminent masters of physical science who are independent of industrial electric lighting interest. One of these authorities, Professor John Perry, happens to be the actual President of the Institution of Electrical Engineers; and his colleague, Professor Ayrton, is a Past-President. Neither has ever taken the narrow technical view that everything connected with commercial electricity supply is for the best in the best of all possible technics. They are as free to act for any gas company, in the circumstances, as Mr. Wordingham was to publish in the "Electrical Review" his own candid opinion of the gravity of the risk of electrolytic damage to the gas and water mains of the Manchester Corporation from the Corporation's own electric mains.

Matters would be at a pretty pass if a professional man dared not acccept a retainer, in the open market as it were, for adequately setting forth a particular aspect of a matter upon which an impartial tribunal is required to adjudicate, merely because he happened to be an acting or past office-holder in a professional society. Besides, the case sought to be made out against the loyalty of Professors Perry and Ayrton is absurdly weak, and sadly misrepresented. Because the object of the Institution of Electrical Engineers is stated to be to promote the general advancement of electrical science and its applications, wonder is expressed how the President can promote this object by giving evidence "in favour of a gas company, and against an electrical undertaking." That is certainly not the right way to put it. The question at issue was merely one of safeguarding the public; yet this is misrepresented as "a claim by a gas company to interfere seriously with an electrical undertaking." The larger interests of electrical science and industry have already suffered much from the propensity of perfervid advocates of temporary phases of the electricity supply business to over-ride every kind of objection to the instant gratification of their interested desires. We have heard before now professors dilate with enthusiasm on the beauties of overhead electric lighting wires, festooned from post to post through the public parks. Opposition to this view was also a "serious interference with electrical undertakings"—for the time being. So it is with this question of the liability for electrolytic damage to gas and water mains. When all the responsibility for wasted electrical currents is placed upon the right parties, perhaps they will learn how to economize in this regard. Professors Perry and Ayrton are kind to electrical science in helping to cure slipshod tramway work.

The Hastings electric lighting is a fine example of this kind of municipal trading. The second year's accounts of the undertaking were recently presented—that is to say, thrown at the heads of the Town Council, who were asked to pass them at a day's notice. This was very obediently done; it being evidently understood by those responsible for the hurry that the more the public looked into the balance-sheet, the less they would like it. The figures are certainly not reassuring to the ratepayers. A credit balance of £253 at the beginning of the year has turned into a debit balance of £1488, which the Mayor declares to be "no loss." Matters would look much worse, but for the fact that the Corporation are their own customers to the tune of £2650 a year, being the amount charged for 53 arc lamps on the Front line, at £50 apiece. Not a bad price, either; especially as every other lamp is put out at 11.30, and there is no apparent objection to their being all out when circumstances are unfavourable to their continuance in action. Moreover, the Corporation light the municipal buildings at their own price. It should not be difficult to show a "profit" in these circumstances. Hastings, however, has got its municipal electricity supply for good or for evil; and the ratepayers must perforce pay for the luxury.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 1012.)

Business on the Stock Exchange last week when operations were resumed after the Easter holidays was moderately active, but devoid of any very striking feature. The general tendency at first was fairly strong; but the firmness did not last out quite to the close, so that the final quotations show perhaps almost as many movements one way as the other. The settlement was the principal consideration; and it was adjusted without giving rise to any difficulties. The Money Market ruled easy until towards the close, when the Stock Exchange requirements and other demands produced a more stringent condition; but this should be only temporary. Business in the Gas Market was, on the whole, much below the average volume. On the opening day and the next, there was a good show of activity, and everything pointed to the probability of a brisk week. But it died away rapidly; and for the rest of the week there was not enough business forthcoming to make up one ordinary day's average. Changes of quotation were naturally very few; but they were in the upward direction, and generally the tendency was firm, even where no actual advance was effected. In Gaslight and Coke issues, the ordinary was rather active at first, but fell very quiet afterwards, and prices were steady, never ranging far outside the middle figures 94–95. A little was done in the secured issues, also at about middle prices, without any indication of a tendency to move either way. A few transactions were marked in South Metropolitan at good figures; and the closing prices were the best of the week. The quotation has very properly been drawn in closer, to a three-point margin—a measure which might, with equal propriety, be applied to other issues on the list. Nothing was done in Commercials, except one deal in debenture, which was let go at two points under the quotation. But both the old and the new stocks had a rise in *ex div.* adjustment. The Suburban and Provincial group were quite stagnant, hardly a single bargain being done in them, and quotations being unchanged, but for a slight adjustment in Liverpool. Among the Continental Gas Companies, business was almost a blank; but European had a further slight improvement. None of the undertakings in the remoter world made any sign. Dealings in the Water Companies were very few, and changes in quotation were rare; but the tendency was rather in favour of higher prices.

The daily operations were: On Tuesday, there was some dealing in Gaslight ordinary and South Metropolitan at fairly good figures; but the only change was a rise of ½ in European. Wednesday's business was also in the two big issues. Commercial debenture fell 2. On Thursday, Friday, and Saturday, there was hardly any dealing at all. But on Friday Commercial old rose 3, and the new 1½. On Saturday, New River Water rose 2.

What is described as the first Austrian-built gas-engine operated by the waste gases of blast-furnaces, has just been completed by Messrs. Breitfeld, Danek, and Co., of Carolinenthal, Prague, and installed at the Königshof Iron-Works of the Bohemian Mining Company. The engine, which is built on the Delamere-Debouttéville system, is capable of developing 300-horse power, and is directly coupled to a continuous-current dynamo; the plant supplying current for lighting and power purposes.

Mica as a pipe covering has been found to effect a saving of 88·33 per cent. of the loss in steam condensation which would occur with a bare steam-pipe, according to "Engineering," quoting from a report on the subject by Professor Capper, of King's College. The steam pressure was 259 lbs. per square inch absolute; the thickness of insulation (consisting of flakes of mica laid in parallel planes, without cement or adhesive), 1·6 inches; and the condensation, 1·516 lbs. per square foot per hour with uncovered pipe, and 0·177 lb. with the mica covering.

ACCOUNTS OF THE METROPOLITAN GAS COMPANIES FOR THE YEAR 1900.

—	Chartered.	Commercial.	South Metropolitan.	All the Companies.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Capital and borrowed money	27,272,216 1 7(a)	1,103,251 17 10	7,309,850 0 0(a)	35,685,317 19 5
Income—viz.:				
Sale of gas by meter	3,170,498 2 6	347,159 0 5	1,209,509 8 6	4,727,166 11 5
Public lighting, including lighting under contracts	163,331 10 6	20,931 15 11	59,451 8 4§	243,714 14 9
Rental of meters and stoves	48,581 1 8*	16,075 14 4	75,219 18 9	139,867 14 9
Residual products	1,144,609 2 6	95,353 11 2	638,700 16 10	1,878,663 10 6
Miscellaneous, including old materials	18,826 1 2	1,044 4 6	9,603 19 5	29,474 5 1
Total income from all sources	4,545,845 18 4	480,564 6 4	1,992,476 11 10	7,018,886 16 6
Expenditure—viz.:				
Coal and oil, including carriage and dues	1,839,764 3 5	234,723 13 5	992,062 12 10	3,066,550 9 8
Purifying materials, including labour	80,191 11 0	17,268 14 10	44,918 13 3	142,378 19 1
Salaries and wages—manufacture	391,343 8 6	42,830 7 8	139,905 18 2	574,080 14 4
Wear and tear—manufacture	395,651 8 0	35,137 13 3	183,838 19 1	614,628 0 4
Rents, rates, and taxes	266,321 13 3	15,894 17 6	63,372 15 7	345,589 6 4
Salaries—management	22,220 8 10	2,331 1 6	4,803 12 10	29,355 3 2
Collectors' salaries and commission	41,709 1 10	4,065 17 4	18,228 19 3	64,003 18 5
Stationery, printing, and general charges	22,568 15 1	2,510 12 10	15,025 14 6	40,105 2 5
Directors and auditors	5,960 18 0	2,650 0 0	3,807 0 4	12,417 18 4
Salaries and wages, wear and tear—distribution	177,410 19 6	15,653 9 1	98,525 2 9	291,589 11 4
Repair and renewal of meters and stoves, &c.	163,784 4 3	11,826 18 2	50,901 14 4	226,512 16 9
Law and parliamentary charges	10,813 5 7†	1,463 9 4	9,092 9 3	21,369 4 2
Bad debts and extraordinary expenses	48,436 3 10‡	5,125 3 4	27,706 5 1‖	81,267 12 3
Total expenditure on revenue account	3,466,176 1 1	391,481 18 3	1,652,190 17 3	5,509,848 16 7
Gross profit	1,079,669 17 3	89,082 8 1	340,285 14 7	1,509,037 19 11
Do. per cent. on capital and borrowed money	3 19 2	8 1 6	4 13 2	4 4 7
Do. do. gas-rental	32 7 9	24 4 1	26 16 4	30 7 2

(a) Converted. * Stoves only. † Including £4000, charges *re* quinquennial revaluations. ‡ Including annuities, £29,277; and £2308 on workmen's compensation account. § Including £27,947 12s. for lighting, repairing, &c. ‖ Including £9864 paid to pension, &c., funds, and £13,304 paid under the profit-sharing scheme.

TABLE *showing the Capital, Income, Expenditure, and Profit, per Ton of Coal Carbonized (including Oil), in* 1900.

—	Chartered.	Commercial.	South Metropolitan.	All the Companies.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Capital and borrowed money	12 14 11·56	4 11 4·07	6 8 4·60	10 2 9·35
Income—viz.:				
Total gas-rental	1 11 2·01	1 10 5·69	1 2 3·44	1 8 2·96
Rental of meters and stoves	5·45	1 3·97	1 3·85	9·54
Residual products	10 8·41	7 10·73	11 2·61	10 8·10
Miscellaneous, including old materials	2·11	1·04	2·02	2·01
Total income from all sources	2 2 5·98	1 19 9·43	1 14 11·92	1 19 10·61
Expenditure—viz.:				
Coal and oil, including carriage and dues	17 2·40	19 5·20	17 5·08	17 5·11
Purifying materials, including labour	9·00	1 5·16	9·47	9·71
Salaries and wages—manufacture	3 7·90	3 6·55	2 5·49	3 3·15
Wear and tear—manufacture	3 8·39	2 10·91	3 2·74	3 5·91
Rents, rates, and taxes	2 5·88	1 3·79	1 1·36	1 11·56
Salaries—management	2·49	2·32	1·01	2·00
Collectors' salaries and commission	4·68	4·04	3·84	4·36
Stationery, printing, and general charges	2·53	2·49	3·17	2·73
Directors and auditors	0·67	2·63	0·80	0·85
Salaries and wages, wear and tear—distribution	1 7·90	1 3·55	1 8·76	1 7·88
Repair and renewal of meters and stoves, &c.	1 6·38	11·75	10·73	1 3·45
Law and parliamentary charges	1·21	1·45	1·92	1·46
Bad debts and extraordinary expenses	5·43	5·09	5·84	5·54
Total expenditure on revenue account	1 12 4·86	1 12 4·93	1 9 0·21	1 11 3·71
Gross profit	10 1·12	7 4·50	5 11·71	8 6·90

TABLE *showing the Increase or Decrease in each Item during* 1900 *compared with* 1899.

—	Chartered.		Commercial.		South Metropolitan.		All the Companies.	
	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.
	£	£	£	£	£	£	£	£
Capital and borrowed money	152,201	..	48,921	..	..	558,281	..	357,159
Income—viz.:								
Sale of gas by meter	130,328	..	47,993	..	220,796	..	399,117	..
Public lighting, including lighting under contracts	14,902	..	821	..	..	2,804	12,920	..
Rental of meters and stoves	4,819	..	1,873	..	11,373	..	18,064	..
Residual products	224,950	..	13,378	..	167,961	..	406,290	..
Miscellaneous, including old materials	1,827	..	267	..	1,832	..	3,925	..
Total income from all sources	376,826	..	64,332	..	399,158	..	840,316	..
Expenditure—viz.:								
Coal and oil, including carriage and dues	430,832	..	71,142	..	362,688	..	864,661	..
Purifying materials, including labour	10,327	..	3,434	..	13,643	..	27,404	..
Salaries and wages—manufacture	5,457	..	2,774	..	11,094	..	19,325	..
Wear and tear—manufacture	29,436	..	1,825	..	8,460	..	39,721	..
Rents, rates, and taxes	22,910	..	821	..	3,336	..	27,067	..
Salaries—management	..	440	..	128	4	..	..	564
Collectors' salaries and commission	958	..	88	..	1,130	..	2,176	..
Stationery, printing, and general charges	1,203	..	..	17	3,868	..	5,113	..
Directors and auditors	..	21	..	..	1	..	..	20
Salaries and wages, wear and tear—distribution	..	7,329	1,207	..	3,491	..	..	2,631
Repair and renewal of meters and stoves, &c.	58,282	..	1,137	..	4,576	..	63,996	..
Law and parliamentary charges	5,984	..	981	..	7,938	..	14,904	..
Bad debts and extraordinary expenses	2,392	..	1,116	..	..	8,175	..	4,667
Total expenditure on revenue account	560,051	..	84,380	..	412,054	..	1,056,485	..
Gross profit	..	183,225	..	20,048	..	12,896	..	216,169
Do. per cent. on capital and borrowed money	..	£0 14s. 0d.	..	£2 5s. 6d.	£0 3s. 5d.	..	..	£0 11s. 2d.
Do. do. gas-rental	..	7 4 5	..	9 19 6	..	£6 15s. 9d.	..	7 9 8

TRADE IN THE MARCH QUARTER.

With the publication of the Board of Trade returns for the month of March, it becomes possible to take note of some of the principal features of the business, both home and foreign, done during the past quarter. By whatever means the state of trade is tested, the same conclusion is reached—that the wave of prosperity that set in some five years ago is distinctly on the ebb.

To take first the import and export trade of the country. At first blush, the import statistics appear to denote a flourishing state of affairs; there being an increase of over £4,900,000 in the quarter, as compared with the first three months of 1900. But an analysis of the figures puts a very different complexion on the case. Had it not been for an increase of £6,300,000 in articles of food and drink, and of £600,000 in raw materials for textile manufactures, there would have been an actual decrease in the imports of £2,000,000; and the increases mentioned are in no sense indicative of more active trade. The food and drink statistics, upon examination, show, first, that an enormous quantity (about £2,000,000 worth) of sugar and considerable quantities of other food-stuffs have been rushed into this country in anticipation of duties being imposed by the Chancellor of the Exchequer this week; and, secondly, that we are paying higher prices for the food we are importing. About £1,000,000 of the recorded increase was due to the higher price of the meat imported, and other articles also show considerably enhanced costs.

Similarly in regard to the raw materials for manufacture. The quantities of raw cotton imported in the March quarter of 1899, and the two following years, were 6·54, 4·79, and 4·77 million cwts. respectively. For these quantities, we paid 11·63, 11·60, and 13·33 millions sterling. So that a less quantity of cotton bought this year has cost us 1¾ millions of money more than the larger quantity did last year. These facts completely shatter the notion that the increase in the total value of our imports in the past three months is a sign of growing prosperity. They show that we have been paying more dearly for our food and for our raw materials—a very different matter.

The exports (including re-exports) show an actual falling off of £1,800,000; and this figure would have been more than doubled, but for the large increase (£2,400,000) in the value of new ships sold to foreign countries—an increase that will probably be neutralized in the course of the year. The real decrease of over £4,000,000 is due principally to coal and iron. The quantities of, and prices realized for, the coal exports during each of the past three March quarters were as follows:—

Coal, &c., Exported and Shipped by Merchant Steamers.

March Quarter.	Tons.	Price Realized (Exports only).
1899 ..	12,558,900 ..	10s. 4d. per ton.
1900 ..	13,114,155 ..	15 8 ,,
1901 ..	12,334,572 ..	14 6 ,,

The value of these exports for the three months just past shows a decrease of £785,200. The iron and steel figures show a much more rapid decline:—

Iron and Steel Exported.

March Quarter.	Tons.	Value.
1899 ..	708,653 ..	£5,473,155
1900 ..	962,457 ..	8,248,268
1901 ..	616,826 ..	6,030,258

It will be seen that the prices realized still considerably exceed those obtained in 1899, before the acute stage of the "boom" was reached. When to the 345,631 tons less of iron and steel exported is added the increase in the quantity imported—namely, 44,165 tons (65,321 tons, against 21,156 tons), we get a total decrease in the demand upon our manufacturers of 389,796 tons of iron and steel, apart from the falling off in home requirements. What this falling off has been, it is impossible to ascertain by means of direct statistics; but it is certain to have been very considerable. We know that the total number of iron furnaces in blast at the end of March was 39 less than on Jan. 1, and 88 less than on July 1 last; so that the make of pig iron during the quarter was probably at least 500,000 tons lower than in the first three months of 1900. The reduction in the quantity of coal required by the iron and steel works of the country will therefore not have been much less than 1,500,000 tons. Adding to this the 780,000 tons less exported during the quarter, we get a falling off in the demand for coal of over 9 million tons per annum, or 4 per cent. of the total output.

The railway traffic returns confirm the other indications of slacker trade. Receipts from goods carried on the 39 principal lines for the quarter show a reduction of £432,653, or 3½ per cent., as compared with the first thirteen weeks last year. The decrease is spread over all the companies. The Board of Trade statistics as to the tonnage of vessels entered and cleared with cargoes during the quarter tell the same story; the aggregate tonnages being 463,000 tons less than in the corresponding period of 1900. The labour market shows a steadily (if gradually) increasing margin of unemployed hands. Wages are beginning their descent from the unusually high level of the past months; while taxation has grown heavier, and is bound to be still further increased in the immediate future. All signs, in fact, point to a considerable slackening of the trade activity of recent times, and to the advent of a period of moderate prosperity, if not of actual depression. This is a prospect which gas managers cannot be expected to regard with unqualified regret, after their recent experience of the meaning, to the gas industry, of "good times."

PERSONAL.

Mr. John F. Irvine, of Kilmarnock, has been appointed Manager of the Kirkcudbright Corporation Gas-Works.

Mr. James Shiell, lately of Moffat, has been appointed Manager of the Berwick and Tweedmouth Gas Company.

Mr. Mountain B. Watson, youngest son of Mr. Peter Watson, who was for many years Manager of the Stirling Gas Company, is the successful candidate for the appointment of Manager of the West Calder Gas-Works, in succession to Mr. C. Winton, who has gone to Moffat.

Mr. Robert Wilson (for many years with Messrs. Jonas Drake and Son), who has recently been appointed Engineer of the Malta Gas-Works, was presented last Thursday with a gold albert and pendant by the principals of the above-named firm, and with a travelling-bag and gold scarf-pin by the staff, on leaving to take up his new duties.

Last Wednesday, the employees of the Worksop Gas Company presented the late Secretary, Mr. M. Hill, who has relinquished the position after nineteen years' service, with a *souvenir* of his connection with the undertaking in the shape of a silver-mounted Malacca cane. The presentation was made by Mr. F. Kent, who said the gift was a small token of the respect in which Mr. Hill was held by the donors, who desired to record in this way their admiration of the manner in which he had always met them. Mr. Hill suitably responded.

A report having got into circulation of the death of a Mr. Andrew Stephenson (or Stevenson), which, from certain attendant circumstances, has led to the supposition that the reference was to the well-known occupant of offices in Palmerston Buildings, we are pleased to state that the gentleman in question is still in a position to testify to his numerous friends its erroneousness, and to give them his personal assurance that, while their sympathy was appreciated, it was happily entirely misplaced.

OBITUARY.

We regret to record the recent death, at his residence, "Norsted," near Chelsfield, Kent, after a painful illness, of Mr. William Hughes, Chairman of the Sevenoaks Gas Company. The deceased gentleman became a Director of the Gas Company in 1875, and succeeded the late Mr. Edwyn Evans Cronk as Chairman in 1886, and held the position till his death. He was a very capable administrator, and a shrewd man of business.

After a disappearance of some years from the world of gas, we learn that Mr. Edwin Tatham, of Balmain, Australia, whose name is associated with the oxy-oil gas process, succumbed on Friday after a long illness. Some readers may possibly recollect the publication in the "Journal," as nearly as possible eleven years ago, of the first specification taken out by Mr. Tatham for his patent, and the subsequent prominence given to his process by Dr. L. T. Thorne, in the paper which he read before the Gas Institute at the meeting held at Ryde in 1890. An English Syndicate was formed to work the process in conjunction with Brin's Oxygen Company, of which Dr. Thorne was then the adviser; an experimental station was fitted up in Salisbury Square, and a trial of the process on a practical scale was later made at Huddersfield, under Mr. W. R. Herring, who was then the Corporation Gas Engineer. In November, 1893, Dr. Thorne brought the process under the notice of the Southern District Association, in a paper which gave rise to a very long discussion; but since then little has been heard of Mr. Tatham or his process.

A large number of our readers will, we are sure, sympathize with Mr. Corbet and Mr. Henry Woodall, in the bereavement they have sustained by the death of their brother, Mr. William Woodall, formerly M.P. for Hanley, which took place early on Monday morning last week at Llandudno, where he had passed the winter. The deceased gentleman, who was born at Shrewsbury in 1832, was the senior partner in the firm of Messrs. James MacIntyre and Co., potters, of Burslem. He first entered the House of Commons as Liberal member for Stoke-upon-Trent in 1880; but five years later, when Hanley was made a parliamentary borough, he was returned for that constituency, which he continued to represent down to the last General Election, when he retired, owing to failing health. When Mr. Gladstone formed his third Government in 1886, Mr. Woodall was appointed Surveyor-General of Ordnance; and in 1892 he was selected as Financial Secretary to the War Office—serving under both Mr. Gladstone and Lord Rosebery. During his parliamentary career, Mr. Woodall rendered valuable service as a member of the Royal Commission on Technical Education; visiting all the chief centres of manufacture on the Continent, and making himself an authority on the subject. In the general movement for the promotion of technical education in this country, he was an indefatigable worker. He was a Justice of the Peace for Staffordshire; was for twelve years Chairman of the Burslem School Board; and was also Chairman of the Free Library, the School of Art, and the Endowed Schools in the town. Some years ago, he accepted the post of Manager of the gas-works there; having previously been trained as a gas engineer with the Liverpool United Gas Company. He was at one time the President of the Association of Municipal Corporations and of the North Staffordshire Association of Mining and Mechanical Engineers; and he was a Chevalier of the Legion of Honour.

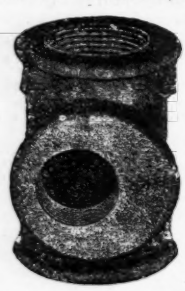
NOTES.

The Flash-Point of Lamp Oil.

A curious statement bearing upon the interested agitation for raising the flash-point of lamp oil for the United Kingdom, has been published in the "Petroleum Review." It is in the form of a report of an interview between the Editor of this periodical and a deputation of the London United Workmen's Committee, whoever they may be. These delegates came from the East London District Office of the Committee, and declared their hostility to the movement headed by Messrs. Ure and Reckitt, on the ground that to raise the flash-point as proposed would seriously injure the working classes, who use chiefly the low-flash oil for lighting. They prefer it, because they think it is brighter in burning than any other, and readily pay a little more for it on that account. The deputation stated that the people for whom they spoke do not use kerosene cooking-stoves to any extent. It was asserted that in the Barking Road region, prepayment gas-meters are used to a small extent; but chiefly by the better class of mechanics. In this locality, 50,000 poor householders are described as dependent on oil for burning. If so, here is a good opening for the extension of the prepayment gas-meter system, which should prove to the cottagers that gas is cheaper than oil, to say nothing of the convenience of having a gas cooking-stove.

Eccentric Pipe-Fittings.

A writer in the "Ironmonger" draws attention to the uses, for special purposes, of eccentric pipe-fittings. These he describes as being comparatively novel, and not as yet procurable in more than three varieties—the eccentric reducing socket, bushing, and tee. As illustrated, the eccentric tee is a strange-looking object.



It is in the main an ordinary tee; but the aperture of the outlet is not central with the bore of the pipe. The advantage of this is that where it is desired to drain a line of pipe sideways of deposit along the bottom of the pipe, or to take off air from the top of it, the eccentric attachment enables it to be done perfectly. Where a line of pipes has to be reduced in bore, for any purpose, it is often very desirable that the line of the top or the bottom of the pipe should be uninterrupted. This is not possible with the ordinary pipe fittings, which work centrally, but is the very object sought to be attained by this eccentric fitting. Whether for hot-water work, therefore, or for steam piping, the possibility of using an eccentric connection is something worth remembering. We are under the impression that cast-malleable eccentric pipe-fittings were many years ago put upon the market, but cannot be sure of the fact.

Combined Conduit and Trolley-Wire Systems of Electric Tramway Traction.

Mr. A. N. Connett has introduced to the Institution of Mechanical Engineers his suggestion for solving the problem of the safe transmission of electric power to tramways. This is for the combination of the trolley-wire with the conduit, with the object of meeting the requirement of cities where a congested centre cannot tolerate the overhead wire, although this cheap and handy carrier of electricity would be tolerated for the outlying districts. It seems at first sight a simple matter to arrange for changing-over the driving attachment from one system to the other; but experience shows that the operation is not so easy as it looks. The matter is one of elaboration of detail, and therefore Mr. Connett's paper was not very easy reading for those who have had no previous experience of the subjects treated. Unfortunately, the estimated cost of Mr. Connett's ideal conduit is rather high—over £16,000 per mile of single track—which must tend to limit the adoption of the system. It is stated that in Paris the system is largely used for portions of the tramway lines to which overhead trolley-wires would be obviously inapplicable. One important recommendation of the plan is that the insulation is complete; so that there will be the smallest possible drop of potential. There is the possibility of considerable saving in this, not least in the matter of total avoidance of electrolysis. In view of the increasing importance of the last-mentioned consideration, every tramway system which can claim to be entirely harmless deserves recognition.

Another Tall Chimney.

The "Engineer" has furnished some particulars in regard to a brick chimney, 360 feet high, which is now being built at the works of the Orford Copper Company, near New York, in order to discharge the fumes and gases at such a height that they will not be a nuisance to the neighbourhood. It has but a single shell, and for 30 feet above the foundation it is square—the flues entering this portion. Above this it is circular, with an interior diameter of 20 feet at the base and 10 feet at the top. The foundation consists of 360 piles, 24 inches between centres, driven 15 feet into a bed of solid gravel, and capped by a block of concrete, 41 feet square and 13 feet high. The shaft is of moulded red bricks having radial ends, and curved interior and exterior faces, with vertical perforations through the body of the bricks. They are 4 inches thick, and vary in length from 12 inches at the base to 11 inches at the top. The large size decreases the number of bricks and joints, while the radial form makes the joints narrow. Mortar entering the holes tends to bond the bricks together, while the hollow spaces prevent too rapid heating and cooling of the shell—thus enabling a single-shell chimney to be safely built. The thickness of the circular shell is about 46 inches at the base and 11 inches at the top. The outside face has a batter of 1 in 40, while the inside has 2-inch offsets 16½ feet apart. The chimney is strengthened by wrought-iron bands, $\frac{5}{16}$ inch thick and 3½ inches wide, 8 feet apart. It weighs 3475 tons, or 5·57 tons per square foot of foundation. A fire-brick lining is built for 42 feet above the flues, as the gases enter at a temperature of 1500° Fahr.; brick partitions being built to equalize the flow and prevent conflicting currents.

TECHNICAL RECORD.

THE CHANGE OCCURING IN THE ILLUMINATIVE VALUE OF MANTLES WITH LAPSE OF TIME.

By Dr. Emil Liebenthal, of Charlottenburg.

[A paper presented to last year's Meeting of the German Association of Gas and Water Engineers at Mayence, and subsequently to the International Gas Congress at Paris as a supplement to Dr. Bunte's paper on "Incandescent Gas Lighting."* It is included in the recently issued "Compte Rendu" of the Congress.]

The foremost position occupied by Germany in the industry of incandescent gas lighting, has rendered it desirable that experiments should be made in that country on the incandescent gas-light, with a view to determining the duty afforded by the different varieties. These experiments ought to be as numerous as possible, and strictly comparable. At Dr. Bunte's suggestion, therefore, the German Association of Gas and Water Engineers, in April, 1899, communicated with the Imperial Physical-Technical Institute, which gladly consented to co-operate in such experiments, having regard to their general public interest. In October, 1899, a meeting of a Committee, consisting of members of the Association and representatives of the Institute, took place at the Institute at Charlottenburg, under the chairmanship of Herr Hagen. At that meeting, a number of conclusions were arrived at as to the projected testings; and of these, the most important ones bearing on the report of the results obtained up to the present time are the following: The investigations in the first place were to be only for purely instructive purposes, and were to relate only to determining the intensity of the light and the ash contained in the mantle, and not to durability. Secrecy was to be preserved as to the manufacturers. Members of the Committee had to procure the required mantles privately through trustworthy persons, and had to be sure that the best quality was obtained in each case, as for the most part firms supply several qualities. Five firms, who supply approximately 75 per cent. of all the mantles made in Germany, were selected for the first series of tests. Two groups of less important firms are to be dealt with later.

The photometrical testing was assigned to (1) the Charlottenburg Imperial Institute; (2) Dr. Bunte; (3) Herr Drehschmidt; (4) Herren Krüss and Leybold; and (5) Herr Schäfer. The determination of the ash of the mantles was entrusted to the first three of these observers. For both these investigations four mantles were employed at each place. Herr Schäfer was commissioned to procure the necessary apparatus for burning off by means of gas under high pressure, and, in collaboration with Herr Drehschmidt, to prescribe the pressure to be used and the duration of the hardening process. Welsbach ("Auer") burners were employed, with 25 cm. [nearly 10 inch] Jena glass chimneys, for the testings. Magnesia props 70 mm. (2¾ inches) long, measured from the upper edge of the burner to the lowest part of the fork, were used. The average horizontal intensity of the light was found by measurements in ten directions. As sources of light for the comparisons, incandescent electric lamps were used, or where their use was impossible, "jewel" burners.

Only mantles free from blemishes, and fitting closely round the burner, were used in the testings. Any mantle which showed at the outset a difference of more than 15 per cent. between the maximum and minimum readings in the ten directions was discarded at once, because of its great want of equality. Mantles which suffered injury during testing were replaced by others. The photometrical tests were made after the first hour, after twenty-four hours, and again after 100 and 300 hours' use. Tests were not to be made at over 300 hours, as the intensity of the light diminishes but little after this time; and it was not intended to test the durability of the mantles. The pressure of gas employed was between 30 and 35 mm. (12 to 14 tenths nearly), and the rate of consumption between 100 and 125 litres (3·53 to 4·41 cubic feet) per hour. Within these limits, gradual enlargement of the holes of the nipples, or selecting a nipple out of five or six different ones, was resorted to in a preliminary trial of each mantle on the photometer, in order to secure the highest absolute intensity of light (not the highest degree of economy). Every subsequent photometric observation was carried out with the use of the appropriate nipple under two conditions—viz., first with the pressure used in the preliminary trial, and secondly with the greatest intensity of light

* See "Journal," Vol. LXVI., p. 642.

attainable by turning the tap (diminishing pressure). In addition, the gas used was tested by means of a hollow-top burner at a consumption of 5·3 cubic feet per hour; and a determination of its calorific power was also made by means of Junkers' calorimeter. The results of testings had to be communicated to the Charlottenburg Institute as soon as possible.

These conclusions as to the manner of conducting the testings having been arrived at, Professor Bunte forwarded mantles in November, 1899, and Herr Schäfer the burning-off apparatus in December, 1899, to the different observers; but the hollow-top burners, and the directions for burning-off, were not sent until four weeks later, whereupon the testings were begun. Three observers have sent in their results; and the Charlottenburg Institute was thus put in the position to work out the results obtained at four places. The measurements made at the highest intensity of light obtainable, after the periods of use agreed upon, gave the values which are collected in Table I., for the absolute intensity of light, and the consumption of gas per hour per candle. [The values in the original are stated in Hefner units; the values given in the following tables, &c., are calculated therefrom on the assumption that 1 Hefner unit = 0·877 English candle.]

TABLE I.

Description of Mantle.	Absolute Intensity of Light, in English Candles, after Use for—				Cubic Feet of Gas Consumed per Hour per Candle, after Use for—			
	1 Hr.	24 Hrs.	100 Hrs.	300 Hrs.	1 Hr.	24 Hrs.	100 Hrs.	300 Hrs.
A . .	81	74	61	53	0·052	0·056	0·068	0·076
B . .	75	68	58	53	0·056	0·060	0·072	0·076
C . .	75½	74½	69	67	0·056	0·056	0·060	0·060
D . .	73	70	63	56	0·056	0·060	0·064	0·072
E . .	65	65	60	53	0·064	0·064	0·068	0·076

These numbers are the means of the values found by the different observers—that is to say, means of 16 values. The results of the observers were in close agreement. The different makes of mantles are indicated by the letters "A" to "E," in order to preserve secrecy as to their actual origin.

At the start, therefore, mantles "A" gave the highest intensity —viz., 81 candles; then came "C," "B," and "D," with about 75 candles; and lastly "E," with 65 candles. After 300 hours' use, "C" gave 67 candles; while the other makes had fallen off to about 53. With regard to the consumption of gas per candle-hour, make "A" started best of all, with only 0·052 cubic foot; then came "B," "C," and "D" makes, with 0·056 cubic foot; and, lastly, "E," with 0·064 cubic foot. But at the end of the trial, the consumption per candle-hour had risen to 0·076 cubic foot for "A," "B," and "E," and to 0·072 cubic foot for "D;" while for "C" it was only 0·064 cubic foot. These results indicate that at the end of 300 burning hours, the light afforded had diminished for the different makes by about—A, 35; B, 28; C, 12; D, 23; and E, 19 per cent. of the initial intensity; or 29, 22, 11, 20, and 19 per cent. of the light found after 24 hours' use.

The five makes afforded throughout the 300 hours an average light at an average gas consumption per candle-hour as follows:—

	A.	B.	C.	D.	E.	Mean of all Makes.
Light, candles.	60½	58	69	61	58	61
Cubic feet consumed per candle-hour	0·068	0·072	0·060	0·064	0·072	0·068

The investigations, made throughout at the highest intensity obtainable under the conditions prescribed, showed the most favourable results for "C" mantles. The readings made at the pressure of the initial testing show, as was to be expected, values for the light at the end of 300 hours' use about 5 per cent. lower than those recorded above, and the consumption per candle-hour about 17 per cent. greater. The total consumption of gas per hour was about 4·24 cubic feet as an average of the five makes used under these conditions. These figures, however, were not closely investigated, as the primary object of the tests was to determine the duty afforded by the mantles.

In order to obtain information as to the subsequent behaviour of the mantles, the Charlottenburg Institute allowed the best and the worst of each make to burn for 300 hours longer—or, in all, 600 hours. The following table gives the results of these testings, which were made at the maximum intensity under the conditions laid down:—

TABLE II.

Description of Mantle.	Absolute Intensity of Light in English Candles, after Use for					Cubic Feet of Gas consumed per Candle-Hour after Use for				
	1 Hr.	24 Hrs.	100 Hrs.	300 Hrs.	600 Hrs.	1 Hr.	24 Hrs.	100 Hrs.	300 Hrs.	600 Hrs.
A . . .	77	70	58	51	47	0·056	0·060	0·072	0·076	0·081
B . . .	74	68	55	53	45	0·056	0·060	0·072	0·072	0·085
C . . .	74½	75½	72	72	69	0·056	0·056	0·060	0·056	0·056
D . . .	77	72	62	56	56	0·056	0·060	0·064	0·064	0·060
E . . .	67	65	57	53	52	0·064	0·068	0·072	0·072	0·072

With the exception of make "B," which showed a marked deterioration, the light and consumption remained nearly constant between 300 and 600 hours; and therefore a period of 300 hours' use appears to be sufficient for comparative trials of this kind.

A fresh investigation, extending likewise to 600 hours, made by the Charlottenburg Institute with two other mantles which were purchased privately about the middle of February, 1900, through a trustworthy man from the firm "C," led to nearly the same results as are shown in Table II. The "C" mantle had again proved the best in these trials extending to 600 hours. It should, however, be mentioned that quite recently the Institute obtained one specimen of another description of mantle, which was found to surpass "C" in illuminating power, and to be about as good, so far as constancy was concerned. The light afforded by it after 300, 1000, and 1500 hours' use was only about 11, 13, and 19 per cent. respectively less than its initial intensity.

With regard to the general conditions of the investigations, it is to be observed that—

1.—The illuminating power with the hollow-top burner was found to vary greatly with the different observers—viz., from 7·2 to 12·5 candles [at 5·3 cubic feet per hour].

2.—On the other hand, the calorific power of the gas at the different places where the observations were made did not vary greatly; the extreme values being 137 and 154 calories per cubic foot. From this it would seem that at the present time, when flat-flame and Argand burners are being displaced by incandescent burners, gas-works generally should attach less importance to the production of a highly illuminating gas than to that of a gas with as high and uniform a heating value as possible. The generally good agreement between the results obtained by the different observers is to be ascribed to the calorific value of the gas used being in all cases nearly the same.

3.—The determinations of the ash left when the unburnt-off mantles were incinerated gave the following percentage: A, 17; B, 15; C, 11; D, 14; and E, 19. Consequently, make "C" gave the smallest proportion of ash, and make "E" the greatest.

4.—The descriptions "B" and "C" kept their shapes well; but the others contracted rather badly near the top and above the edge of the burner.

In conclusion, it is necessary to emphasize the fact that the investigations described are intended only to afford a glance at the present position of the incandescent lighting industry, and to allow conclusions to be drawn as to what is at the present day to be required of a mantle. They ought to impel the manufacturers to attempt still further improvements. Decisive opinions on the matter must not be given until the testings have been multiplied. It was indicated to the Committee that firms might by accident send out inferior mantles; and this appears to have happened, judging from some results obtained by two observers. But the experiments have shown that the industry has already succeeded in producing mantles which give a reasonably high initial illuminating power, and show but a comparatively small diminution thereof in the course of at least 600 hours' use. An early continuation of the investigations is urgently to be desired.

After Dr. Liebenthal had read the foregoing paper at the meeting of the German Association of Gas and Water Engineers, Professor Bunte commented on it at considerable length. In so far as his remarks on that occasion were not subsequently embodied in his paper on "Incandescent Gas Lighting" at the Paris Gas Congress, we give their substance below:—

Professor Bunte said that the intention was to establish by these investigations what illuminating power was to be expected from good descriptions of mantles at that time, and how much light was obtainable on the average, under normal conditions, from illuminating gas if the gas was burnt in Welsbach instead of in the flat-flame or Argand burners formerly in use. The investigations so far showed that a good, carefully burnt-off mantle, with a consumption of 4½ cubic feet of gas per hour under a pressure of 12-10ths, afforded an average light of 61½ candles. At first, the light generally exceeded 70-candle power; but after 300 hours' use, it ought not to fall below 52½-candle power, nor to show any appreciable diminution on further use. Having regard to the broad basis on which the investigation was made, its results should have general application. Therefore, on considering the extraordinary enhancement of light which incandescent lighting had brought about in recent years, it would be seen that, in comparison with the old open-flame system of lighting, it had effected a cheapening of gas equivalent to reducing it in price to about one-fifth of what it formerly was, while a corresponding improvement in the hygienic conditions had at the same time been attained, since the heat developed, and the quantities of products of combustion, had been reduced in at least equal ratio.

Other points of interest, in addition to the fact that the quality of the gas as shown by photometric tests with flat-flame burners had but little effect on the duty obtainable from the mantles, were the construction of the burner, the air supply, and the pressure under which the combustion took place. The Committee limited these first series of testings to gas pressures of 12-10ths to 14-10ths, which were usually obtainable direct from the town services; but it was well known that the illuminating duty increased with the pressure of the gas. Analyses of the mantles showed that all

those investigated were made of the Welsbach type of mixture—*i.e.*, of thorium oxide with about 1 per cent. of cerium oxide. The degree of purity of the components was of supreme importance, for impurities which could barely be detected by analysis, appeared to affect to an appreciable extent the illuminating power of the mantle. Great extension of our knowledge of the rare earths had, however, recently taken place, and should lead to valuable results in the production of mantles. The nature of the net which was saturated with the salts of the rare earths also played an important part in the manufacture of good mantles; and more attention was now given to this point than formerly.

The way in which the mantle was burnt off, and the formation of a mantle of good shape, which would not be distorted on long use, were also most important factors. Often the requisite care and knowledge were wanting in these matters. Only a mantle which had been well burnt off and carefully hardened by means of gas under high pressure, would afford good lasting illuminating power. In these investigations, therefore, it had been decided to adopt a uniform method of burning off. Distortion of a mantle removed a part of it from the proper zone of the flame, and consequently brought about a diminution of the light. Dust in the atmosphere also caused a deterioration of the light, by settling on the mantles and contaminating their component material. The investigations described were made for the most part in rooms free from dust, and therefore were not influenced by this disturbing element. The investigations, however, were, so far as possible, made under generally prevalent conditions; and their average results might be taken to represent the lower limit of the duty obtainable from mantles at the present time. The great activity and competition among manufacturers would, he believed, lead to further considerable improvements in mantles within the next few years.

WAVERLEY ASSOCIATION OF GAS MANAGERS.

Half-Yearly Meeting at Innerleithen.

On Thursday last the Eightieth Half-Yearly Meeting of the Waverley Association of Gas Managers was held at Innerleithen Mr. W. M'Giffen, formerly of Earlston having, shortly after his election to the post of President, removed to Huntly, in Aberdeenshire, was unable to be present, and Mr. Alex. Bell, sen., of Dalkeith, was (as at the last half-yearly meeting) called upon to preside.

The Chairman said he was flattered by being again asked to fill the vacant chair. He expected that the actual President would have been there, because there was a short address spoken of in the programme; but, unfortunately, the Secretary had received a letter to say that he could not be present. Therefore he (Mr. Bell) had to inflict himself upon them again. He was always pleased to do anything he could at such meetings, because he was a great believer in the good that resulted and flowed from these informal meetings. The President, apparently (looking to his letter), thought that he could not afford to get away—his was too small a place, and there was nobody who could take on his work when he was absent. He, however, thought the information and knowledge gained at meetings like these was not quite selfish, but was for the good of the works and of the management; therefore he considered it was the duty, and the interest, of Directors and Commissioners, to see to it that their Managers should not only have the time but also the means, to attend such meetings, because they all reaped the benefit.

The Hon. Secretary (Mr. A. C. Young, of Kelso) read the minutes of the previous meeting, which were approved. He then said that it had been their custom to present the President with a medal, but, after due consideration, the Committee thought that Mr. Bell was entitled to the medal this year—and not Mr. M'Giffen. Those members who had the medal prized it very highly; and they all felt that to give away the medal lightly would be losing dignity to it. Mr. Bell, however, had certainly worked for the medal.

The suggestion was agreed to.

The Chairman said that unfortunately they had got no address from the President. He (Mr. Bell) had, however, asked Mr. W. Carmichael Peebles, of Edinburgh, to be present and explain to them the Scott-Snell lamp, which was undoubtedly a thing that would come to the front. It was well that they should be prepared—seeing that the Waverley district was being threatened with electric light. He saw that at the Informal Meeting in Glasgow the previous week, nearly the whole of the discussion was as to whether they should enrich their gas or lower the illuminating power of it. Why was it proposed that they should recommend the lowering of the illuminating power? They all knew that many cannel-fields had failed. They could not now get coal of this class just when they wanted it. Therefore, they must lower the illuminating power of the gas, or get some other enricher. If lowering were to come, it would be better that it should be done slowly. The past had been a terrible winter for some of them. Their coal friends were like the swallows—they turned up in the spring, smiling; but at Christmas, when gas managers were gasping for coal, they never appeared. He would ask Mr. Peebles to describe the lamp.

Mr. W. Carmichael Peebles said that Mr. Bell was through their works at Edinburgh recently; and, seeing the Scott-Snell lamp, he thought it would be a suitable subject for discussion at the meeting of the Waverley Association. [Mr. Peebles, by the aid of a diagram, described the lamp and its working.] He then said that the increase of illuminating power was very great. In a few years, probably, the diaphragm might wear out, and a new diaphragm would be required. Otherwise, there was nothing that could get out of order.

Mr. Adamson (Airdrie) asked if the mantle would be more apt to give way than would be the case in a lamp burning at ordinary gas pressures.

Mr. Peebles said that in the Paris Exhibition the mantles stood 10 inches of pressure; and they wanted to work at from 8 to 10 inches. He thought, therefore, there was no fear of the mantles giving way. But if there were a few renewals in the course of a year, he thought the increased illuminating power would more than make up for the loss upon the mantles.

The Hon. Secretary said that the lamp seemed to be a move in the right direction. They knew that high pressure gave them great benefit in the increase of illuminating power; and perhaps their efforts should have been more in the direction of endeavouring to get the benefit of the waste energy of the gas. The Scott-Snell lamp was going in this direction; and they should welcome it. He asked if the pulsating action would have a tendency to cause a flickering of the light? If it were free from this objection, the lamp was certainly what they wanted in small towns.

The Chairman explained that the elasticity of the gas was so great that no pulsating effect was felt at the burner—the light was as steady as a rock. As to the durability of the mantles under pressure, of course, they required a heavier mantle, because the ordinary mantle would float away; but at Woolwich Arsenal they were able to burn with 50 inches of pressure.

Mr. D. Vass (Airdrie) asked if the upper portion of the lantern were made of a material which would resist the heat, because, if not, an accident might happen, and the water in it be lost. He had seen the high-pressure installation at Dunfermline; and there seemed to be a slight shaking of the mantle—a wave-like motion—caused by a current of air in the lantern.

The Hon. Secretary asked what would be the cost of a three-cluster lamp, to give about 1000-candle power.

Mr. Peebles said that the pulsations were hardly noticeable. The receiver seemed to have been put there to keep down the pulsations. If high pressure could be brought into use everywhere, it would be all right—they could supply gas from the works at the high pressure; but at present, with gasaliers constructed as they are, there would be no seal. He did not know what material the lamp was made of; but the heat did not play upon the water chamber. He had no doubt, however, that any difficulty that occurred would be easily got over. He could not tell what was being charged for the lamp; but it was a patent arrangement, and it was a valuable lamp.

The Chairman proposed a vote of thanks to Mr. Peebles for his explanation of the lamp.

It was agreed—in view of the autumn meeting of the Association having been fixed for Sept. 12—to give the President and Secretary power to alter the date, in the event of its clashing with the Engineering Conference to be held in connection with the Glasgow Exhibition.

The Hon. Secretary submitted a communication from Mr. R. S. Carlow, of Arbroath, the Secretary of the North British Association of Gas Managers, relative to the subject of the standardizing of meter-unions. The communication was to the effect that the Scotch meter-makers having offered certain standards, it should be left to other Associations to say, before January, 1902, whether they adopted the standards or not, after which date the North British Association would consider the subject, and determine what should be done.

The Chairman thought it was putting back the subject to adopt any such policy; but the meeting resolved to instruct the Hon. Secretary to write to Mr. Carlow to the effect that the Waverley Association were agreeable to do what the North British Association suggested.

The Chairman moved that Mr. Young, the present Hon. Secretary, be elected President for the ensuing year.

This was agreed to.

It was also unanimously agreed that Mr. L. Bell (Innerleithen) should be Hon. Secretary for the year.

On the motion of the Chairman, Mr. Young was thanked for his services as Secretary; and he acknowledged the compliment paid him.

The members and their friends, to the number of about forty then dined together—Mr. Young in the chair. They were afterwards entertained by the Innerleithen Gas Company to a drive into the mountainous region to the south of Innerleithen (where the snow was still lying on the higher ground), past the ancient house of Traquair—said to be the oldest inhabited house in Scotland—to the Glen, the charming modern baronial residence of Sir Charles Tennant, Bart., which is a popular resort of tourists. After spending an hour in the conservatories, the company returned to Innerleithen, where tea was served. The party then dispersed; but a number remained and visited the works of the Gas Company. These were found to be under excellent management, but in need of extension, particularly in the condensing and purifying sections.

THE NEW GAS-WORKS AT MULHOUSE.

A recent issue of the "Bulletin" of the Industrial Society of Mulhouse contains the following particulars of the new gas-works in that town, contributed by Herr Kellner, the Engineer, at one of the meetings towards the close of last year.

The contract entered into on Nov. 13, 1856, between the Municipality of Mulhouse and the Gas Company, with regard to the supply of gas to the town, expired on Oct. 1, 1897; and on that day a new one was signed, which will expire on April 30, 1933. Under it the prices to be paid to the Company for gas for municipal and private consumption, which were formerly 12 and 24 pfennige per cubic metre (3s. 4½d. and 6s. 9d. per 1000 cubic feet), have been fixed as follows:—

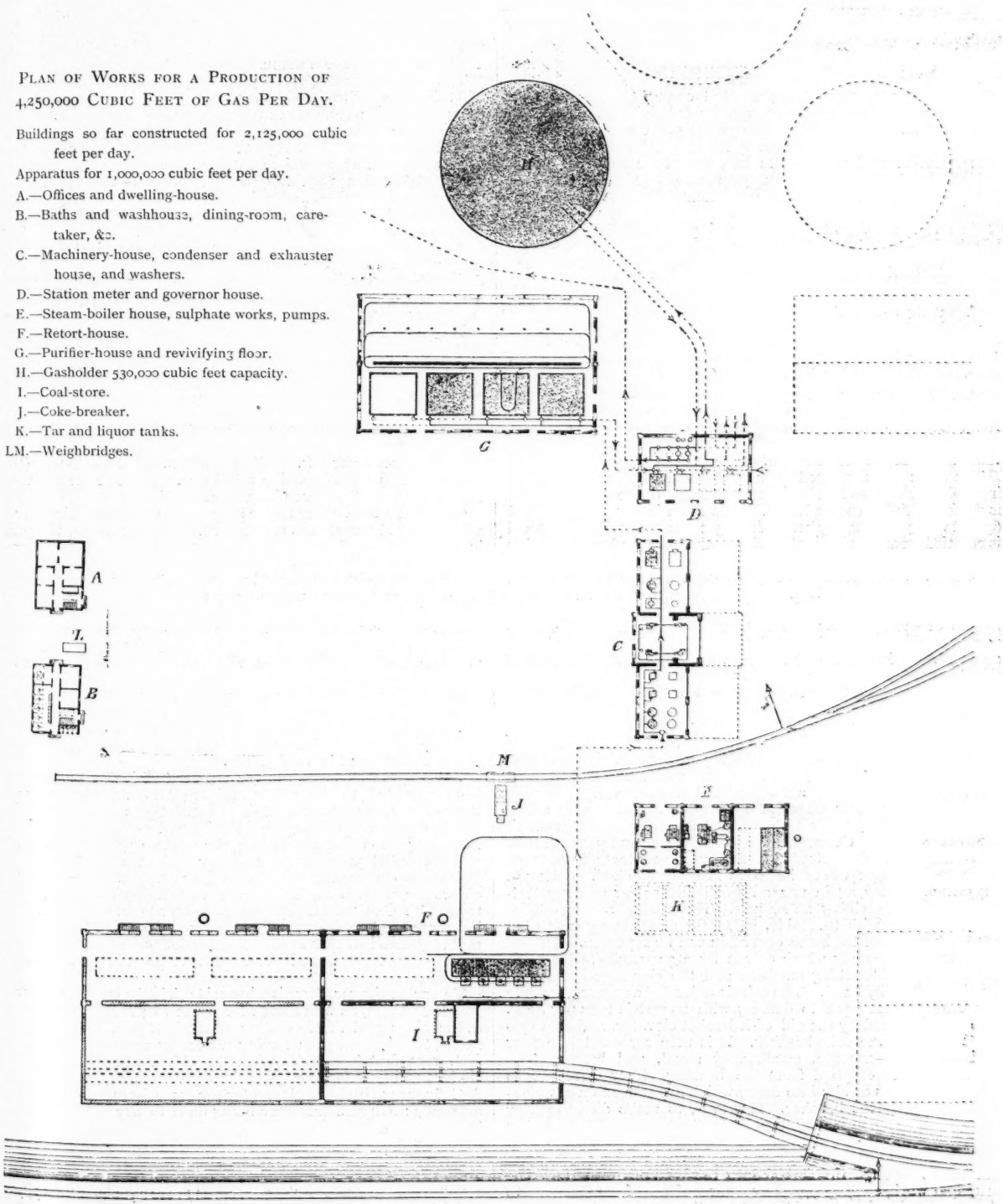
	Municipal Lighting.	Private Lighting.
From Oct. 1, 1897, to June 30, 1905 . . .	8 pf.	16 pf.
,, July 1, 1905 ,, ,, 1911 . . .	7½	15
,, ,, 1911 ,, ,, 1917 . . .	7	14
,, ,, 1917, to April 30, 1933 . . .	6½	13

Gas used for cooking, heating, motive power, or for industrial purposes, is supplied at a reduction of 15 per cent. Since the new scale of charges has been in operation, the consumption has considerably increased; with the consequence that the works in the Faubourg de Belfort were found to be inadequate to the production of the quantity of gas required. As these works were surrounded by houses, they could not be enlarged. Moreover, the railway station being some distance from them, the coal had to be conveyed by the tramway—an element of expense which it was desirable to get rid of. It was therefore decided to erect new works on a site to which coal could be brought cheaply, and to embody therein the latest improvements, not only in regard to manufacturing plant, but also to the health and comfort of the workmen. With this object in view the Company purchased a piece of land, about 32 acres in extent, at the side of the Circle Railway, and bounded by the Ill and Quatelbach Rivers. An overhead line, on wrought-iron pillars, and a line on the ground level, connect the works with the railway. The accompanying ground plan of the works gives an indication of the disposition of the plant.

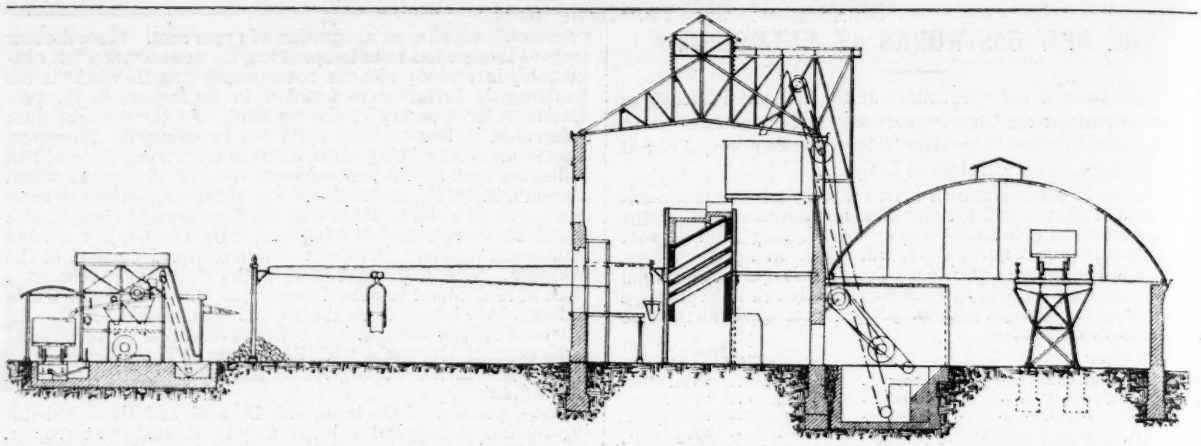
The population of the town, with Dornach and the neighbouring communes supplied with gas, may be estimated at 100,000. Consequently, plans were duly prepared for works equal to a

PLAN OF WORKS FOR A PRODUCTION OF 4,250,000 CUBIC FEET OF GAS PER DAY.

Buildings so far constructed for 2,125,000 cubic feet per day.
Apparatus for 1,000,000 cubic feet per day.
A.—Offices and dwelling-house.
B.—Baths and washhouse, dining-room, caretaker, &c.
C.—Machinery-house, condenser and exhauster house, and washers.
D.—Station meter and governor house.
E.—Steam-boiler house, sulphate works, pumps.
F.—Retort-house.
G.—Purifier-house and revivifying floor.
H.—Gasholder 530,000 cubic feet capacity.
I.—Coal-store.
J.—Coke-breaker.
K.—Tar and liquor tanks.
LM.—Weighbridges.



GROUND PLAN OF THE NEW GAS-WORKS AT MULHOUSE.



Cross Section of the Retort-House, Coal-Store, and Coke-Breaker, at the Mulhouse Gas-Works.

production of 120,000 cubic metres (4¼ million cubic feet) of gas in 24 hours. The complete scheme comprises four sections—one of which, to produce 30,000 cubic metres, or rather more than a million cubic feet, of gas per diem was first constructed. The plant at the old works being in good condition, only a single bench of retorts was put in at first, for a daily output of 15,000 cubic metres. The other portions of the plant were laid out for twice, and the buildings generally for four times, this quantity. The retort-house, however, was only built for a make of 30,000 cubic metres. On the other hand, the station meter and governor house, and the sulphate-house, were made equal to the highest production contemplated.

Entering the works by the principal gate, there is seen to the left the foreman's house and the offices. Opposite the entrance, in the centre of the works, is the engine-house, connected on either side with the buildings containing the condensers and washers—the whole forming one structure. It is surmounted by a water-tank having a capacity of about 13,000 gallons. To the left of the engine-house is the meter and governor house; while on the right are the boiler-house and the building containing the sulphate plant and the pumps. To the left of the meter-house is the purifier-house. Opposite the latter are the retort-house and coal-stores. Behind the purifier-house is the gasholder, the working capacity of which is 15,000 cubic metres, or 530,000 cubic feet. A building containing ordinary and shower baths, a refectory, dressing-room, water-closets, &c., for the stokers is in the longitudinal axis of the retort-house.

The coals are conveyed by an overhead line, constructed on iron pillars about 20 feet high, terminating at the coal-store, which is roofed with corrugated iron. This store is 165 feet long and 65 feet wide; its capacity being about 320 waggon-loads. The coal is emptied from the railway trucks into the store, and, after passing through a breaking-machine, is conveyed by means of a bucket elevator into a bunker 16 feet long, 10 feet high, and 15 feet wide. This bunker will hold sufficient coal for a day's manufacture. The coal-breaking machine and the elevator are worked by a gas-engine of 8-horse power. The retort-house has an iron framework; its dimensions being 165 feet by 46 feet. It will contain two settings of five regenerator furnaces and nine inclined retorts of the Coze type, 15 feet long. The production of each setting is 3000 cubic metres (106,000 cubic feet) of gas in 24 hours, or about 333 cubic metres per retort per day. The generators are placed behind the furnaces, and their dimensions are 6 feet by 7 feet. The ascension-pipes are of cast iron, 6½ inches internal diameter. Each furnace is provided with a special wrought-iron tar-clearing pipe, on the Drory system, with a cup and opening behind for cleaning, and a lid closing automatically. The coke falls from the retorts direct into waggons running upon a line which, on leaving the retort-house, has a downward gradient towards the yard. Consequently, the waggons run by gravitation, and discharge their contents by coming into contact with a catch placed at the spot where the coke is to be stacked. Owing to the gradient, they again run automatically as far as the retort-house, after describing an ellipsis. There they are raised by means of a lift, with turntable, on to the line running in front of the furnaces; and the same operation can be repeated. The lift is worked by a safety winch driven by a gas-engine, which also drives the coal-breaking machine and the elevator; but it can also be worked by hand. The coke is unloaded as near as possible to a coke-breaker equal to dealing with 10 metric tons per hour. The coke is raised by the aid of a bucket elevator, and shot into the hopper of the coke-breaker. It is then screened into four different sizes—average, small, very small, and breeze. The broken coke is emptied from the breaker either directly into railway waggons or else into carts, which are ranged on a weigh-bridge opposite the breaker. However, to make direct loading of the large coke possible, there is in the hopper of the breaker a kind of flap-valve, which can be regulated in such a way that the coke raised by the bucket elevator does not fall into the hopper, but passes through the screen into the waggons or carts. The principal work, such as the conveyance of coal from the store to the bunker, the charging of the retorts, the removal of coke therefrom to the yard, and thence to the breaker, and the loading of the waggons, is all done by motive power, which is profitable for the Company owing to less manual labour being required.

The collecting main is of 32 inches internal diameter, which will allow the gas to flow at the rate of 28 inches per second for a daily production of about 1 million cubic feet, and at the rate of 55 inches per second for twice this quantity per 24 hours. The main leading from the retort-house to the condensers, exhausters, and washers is 26 inches in interior diameter, which allows a velocity of 40 inches per second for a maximum daily production of 1 million cubic feet, and 7 feet per second for a maximum of 2 millions. The chimney is 125 feet high; its internal diameter at the top being 5 feet, and at the base 5 ft. 6 in.

The plant indicated in detail below has been installed for a daily production of 1 million cubic feet of gas: (1) Two air condensers—exterior diameter, 6 ft. 7 in.; interior diameter, 5 ft. 6 in.; height 18 feet—with 18-inch inlet and outlet pipes. (2) Two water condensers, each of six tiers, with water-distributor. They are 17 ft. 9 in. high; the height of each tier being 35 inches internal diameter. (3) Two three-blade exhausters, with steam-engines and governor, inlet and outlet pipes 16 inches in diameter for a production of 53,000 cubic feet of gas per hour, with 80 revolutions per minute. (4) For greater safety in case of stoppage, and to regulate the pressure in the tar-clearing pipes, there is also a by-pass regulator on the Dessau system, with 18-inch inlet and outlet. (5) A Pelouze and Audouin condenser, with 16-inch inlet and outlet. (6) A scrubber 6 ft. 6 in. in diameter and 18 feet high. (7) A "Standard" washer-scrubber equal to a make of 1 million cubic feet of gas per day, driven by a steam-engine.

On leaving the condenser, the main has an internal diameter of 26 inches. It crosses the exhauster and washer house, the plant in which is connected with it. A pipe of similar diameter conveys the gas from the washers to the purifier-house, in which only three cast-iron purifiers were placed at first, each measuring 29 ft. 6 in. by 33 feet, and 4 ft. 9 in. high, only two of which work together. The lids are of wrought iron, convex in form, and are raised by means of a travelling crane. Two purifiers suffice for the daily make of 1 million cubic feet of gas. Reckoning four layers of material, each 4 inches thick, there will be a total of 47 cubic yards in each purifier. With 1·3 cubic yards of purifying material 35,300 cubic feet of gas can be purified daily; so that the capacity of the purifiers is ample. The material is conveyed to and from the purifiers by a suspended railway, the rails of which are connected with the travelling crane. On each purifier lid, there are two test-cocks and two air-valves.

Leaving the purifiers, the gas enters a 26-inch pipe, by which it is conveyed to the meter and regulators. Here it passes through a station-meter capable of registering 1 million cubic feet per 24 hours, and having 18-inch inlet and outlet pipes. It then flows into the telescopic holder, the inlet to which is 28 inches and the outlet 32 inches in diameter. From the holder the gas passes into a 32-inch main leading to the governors, and then enters the main of similar capacity running to the centre of the town. To heat the water in the gasholder tank, to prevent freezing, there are two boilers and the necessary pipes. The hydraulic seal is warmed by means of two steam-jet heaters connected with the pipes. A Zimmerman dial indicator records the contents of the holder.

To enrich the gas, there is a benzol tank in the station-meter and governor house, as well as one for spirit to prevent the freezing of the pipes and the formation of naphthalene. In the boiler-house, two boilers, each having a heating surface of 350 square feet, were first installed. With the object of utilizing the coke cinders and dust for heating, a Kudlicz* grate was fitted to them. A Grüneberg still is employed for the manufacture of sulphate of ammonia; a hydro-extractor being used to dry it. In the same building are two gas-engines, each of 8-horse power (one of them driving a dynamo), and tar, ammoniacal liquor, and fresh-water pumps, all of which can be worked by one or both of the engines.

* This grate was described and illustrated in the "Journal" for July 13, 1897 (p. 109).

Over the pump-room there are two sheet-iron tanks—one for the tar and the other for the liquor.

The portion of the buildings set apart for the use of the workmen comprises rooms for the stokers and yardmen, a kitchen, a dressing-room, and bath-rooms. There are ten shower baths, four combined ordinary and shower baths, and twenty swing wash-basins, with hot and cold water laid on. There are six closets; two being reserved for the foremen. The men's rooms are furnished with tables and benches; also with gas-stoves for culinary purposes. The bath-house is heated by steam, and lighted by a central shaft in the ceiling, provided with a ventilator.

The lighting of the buildings containing the plant is done either by gas or electricity. To prevent explosions, the gas-lamps are built in the walls. Inside the rooms, the glass of these lanterns is hermetically closed, and the products of combustion escape through pipes running to the roof. There are ventilators outside the walls to admit air. For greater safety, and to avoid all accidents, in case of repairs being required inside the rooms, the special dynamo already referred to is provided for electric lighting. The yard, retort-house, and coal-store are all lighted exclusively by gas.

The whole of the works were planned and carried out under the supervision of Herr Kellner, the Company's Engineer, who was assisted by Herr Coburger in the erection of the buildings and the installation of the plant, and by Herr Zwilling in the main-laying work. The contracts were mostly entrusted to firms at Mulhouse; but the gas plant was supplied by special makers. The buildings were completed in a year from the commencement; and the new works were inaugurated on Jan. 27 last year.

NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

(*Continued from p.* 748.)

Mr. H. N. Cheney, of Boston (Mass.), read a paper describing "A Test of a Gas-Engine Electric Plant, at Mechanics Building, Boston," by request of the President, who appointed a Committee for the purpose selected from the staff of the Boston and Brookline Gas Companies. The engine was rated at 20-horse power, had two cylinders with trunk pistons, the cranks set at 180°, was fitted with both electric and hot-tube igniters, and jacketed at the ends as well as the sides of the cylinders. A portion of the water from the jacket was allowed to flow into the exhaust pipe close to the exhaust valve; it being found that this simple plan greatly reduced the noise from the exhaust. The engine was connected by a friction-clutch with a Lundell six-pole dynamo, rated at 125 kilowatts, 122 volts, and 100 ampères at 280 revolutions a minute. The friction-clutch was intended to prevent the dynamo from following too closely the changes in speed of the gas-engine that occur during each cycle, and consisted of three leather-covered shoes fixed to a flywheel on the dynamo shaft, and bearing on the inner surface of a pulley on the engine shaft. The shoes were pressed outward by springs, acting upon them through levers so designed that centrifugal force tended to counteract the springs. The load carried in the test was made up of 16-candle, 110-volt lamps. A wattmeter, ammeter, voltameter, gas-meter, and water-meter were used; also pressure gauges, thermometers, and revolution counters. Six-hour tests were made at full load, three-quarter, half, one-quarter, and no load on the dynamo respectively. At the commencement of each test, the engine was started with electric ignition, and run at the load to be carried throughout the test, until conditions were fairly constant. Then the test was commenced, and the readings of the various instruments taken every 10 minutes for three hours. At the end of that time, the electric igniters were thrown out of use and the tube igniters lighted; and after a 10 minutes' interval, a second three hours' test was made as before. Tests of the regulation were made by suddenly altering the load; the instruments being read simultaneously at one minute intervals.

The results of the various readings were fully set forth by means of tables and diagrams, from which it appears that the gas used had a heating value of 560 to 590 B.T.U. At full load, 17½ per cent. of the heat was recovered as useful work, 3½ per cent. lost by the dynamo, and 47 per cent. by the water jacket; and the proportion of useful work fell as the load was reduced, being only 8 per cent. at one-quarter power. The water in the cylinder jacket was raised to nearly boiling; and the heat absorbed by it represented 3000 to 4000 cubic feet of water raised 1° Fahr. per 1000 cubic feet of gas used. The diagrams showed a marked advantage in favour of the electric, as compared with the hot-tube igniter. Suddenly changing from one-quarter to full load, had the effect of slackening the engine about 6 revolutions per minute, or 2 per cent.; and the dynamo twice that amount. The total cost of the engine was a little over £200; the dynamo, switchboard, and accessories cost £140; and the installation brought up the total cost to something over £500. The cost of the engine alone, fixed complete, might be about £250; the oil, water, and attendance would vary according to the work actually done.

Discussion was invited; and several questions were put to the author. Mr. Walton Clark said that the electric apparatus and lights in the office of the United Gas Improvement Company, at Philadelphia, were operated by three 90-horse power gas-engines in the basement, each coupled directly and rigidly to a dynamo. They had a storage battery with a booster for use in charging it. All the work in the building, including pumping water, working the elevators, and ventilating, was done by these engines, which were shut down at 5 p.m. each day, and the battery took care of the load till next morning. The engines were three-cylinder Westinghouse. He had occasion to set up a 3-horse power gas-engine belted to a 1½ kilowatt dynamo, 120 volts, at his own home; and one of his sons had thoroughly tested it. The regulation was perfect, being less than 1 per cent. for variations from one-quarter to full load. As illustrating the advantage of gas-engines over steam for the work of office buildings, he might mention that the temperature of his engine room was 15° to 20° lower during the summer than that of others where steam was used. He was not altogether satisfied with the clutch arrangement described. Mr. Egner related the experiences of Mr. Walter Thomas at Vancouver, where the Electric Company bought up the rights in the Welsbach patents for the district, and put a prohibitive price on the burners. Mr. Thomas, however, did not give in, but was doing a good trade in small gas-engines and dynamos.

Mr. Cheney, in replying, said that the variations in the speed caused by changing the load were not sufficient to show on the lights. His results proved that the electric igniter was much more economical than the hot tube. The clutch arrangement was not in all respects satisfactory; but when it was tightened sufficiently to reduce the slip to 5 or 6 revolutions per minute, there was quite a perceptible variation of voltage every time the engine took gas, when running at full load. In his tests the voltage was absolutely steady from minute to minute.

Mr. J. J. Humphreys, jun., of Worcester (Mass.), read a paper entitled "Some Sketches of Gas-Governors." Commencing with Clegg's arrangement, patented in 1815, he described the salient features of the most prominent patterns as introduced both in England and in America, including West's (1817), Bacon's (1839), Braddock's, the Isbell, and the Root exhauster governors, the Parkinson-Braddock balance, Foulis, Isbell-Porter standard, Milwaukee damper, Keeling's pressure-changer, automatic governors that increase the pressure when the bell falls, such as the mercury arm, the Isbell-Porter roller weight, the Servier, the Milne and the O'Connor-Milne, the hopper, the Cowan, and several patterns of the Conelly, Cathels, Isbell-Porter's, Hulett and Paddon's, Sugg's, and Williams' district governors, the Pintsch for use with compressed gas, and the Westinghouse, Johnson-Reynolds, and Young's for high-pressure natural gas. The paper was illustrated by means of 21 large diagrams, showing sections of the various appliances referred to.

At the commencement of the discussion, the author was very highly complimented on the completeness of his work and the excellence of his diagrams. Mr. Shelton said that the work done by the author with respect to governors might be extended with advantage to all other apparatus in constant use. Using artificial gas at 15, 20, or 25 lbs. pressure—as he had been doing in several instances, and always with satisfactory results—he had adopted some forms of governor that were not referred to in the paper. The Pintsch and the Johnson-Reynolds governors were substantially perfect for high-pressure service. Other governors of similar type were also perfect for their particular work; but a great deal of care was required in selecting the right governor for the class of work to be done. For instance, natural-gas governors were designed to handle large volumes of gas at comparatively moderate pressures, while the Pintsch governor was intended to control small volumes at high pressures; but the apparatus he required had to occupy an intermediate position in these respects. A governor could be made for any range of volume or pressure; but the point was to get it properly adapted to the work required. One of his first experiences was the reducing of a 30-lb. pressure to the usual 20 or 25 tenths; and he endeavoured to effect this in two stages. A natural-gas governor was put first, to reduce to 5 lbs. pressure, and the second to complete the work. It seemed that the two governors were safer; but in practical working, he soon found that one would do the whole. He had governors in operation, reducing from 40 lbs. to 20-tenths, that did not vary more than a tenth or so in the 24 hours. He had several safety consumers service governors in use, supplied at anything from 5 to 20 lbs. pressure, and maintaining a steady 17-tenths on the outlet. Even if the governor and the protector both failed, there could be no rush of gas at high pressure into the fittings. Mr. F. C. Sherman remarked that he used Hunt's equilibrium governor with satisfaction some 25 years ago, and knew that others also used it; but it was not shown in the paper. Mr. Humphreys, in the course of his reply, said he made no claim to having completely covered the ground. He searched out some 70 different designs, and had an inkling of 30 or 40 more; but one must stop somewhere, and his drawings only included 30.

Mr. C. J. R. Humphreys, of Lawrence (Mass.), read a paper on "Selling Gas." He was more and more impressed with the importance of this subject, and daily grew in the knowledge of the fact that the prosperity of a company depends largely upon the proper selling of its product. In other commercial ventures, the utmost importance was given to the selling department; and he urged that, in the case of gas companies, this department demanded their best consideration. The immediate oversight of it should be under the care of an able man, who, even in a moderate-sized company, would devote all his time to it, and keep in such close touch with the business and with local circumstances, that he would ever be finding new applications for gas. As regards the methods to be pursued in gaining new business, the chief

point to be kept immediately in view was to attract the attention of prospective customers; and any method that accomplished this, could not fail to benefit the concern. He rather deprecated the very general custom of preferring one line only to the exclusion of all others. Some said, for instance, that advertising was no good, and that they believed in canvassing; while others said that canvassing was a failure. But he had never been able to differentiate between the various plans, and thought they all converged to one point—the increase of business. All advertising plans had their value, and the canvasser was a large figure in the problem; but it was a mistake to expect immediate results, or to attempt to figure out closely the returns from one particular venture. The thing must be ever in mind, and every possible method ready for use when opportunity offered. The chief point was to catch the attention; and this might be done by canvassing, posters, advertisements in daily papers, handbills, or pamphlets. It was well to prepare the way for the canvasser, by any means that led to some discussion or consideration of the subject by the householder. He also remarked that, in these days when so much energy was put into the extension of gas for purposes other than lighting, it was well to take care that the lighting department was not neglected. Advertisements as a rule should be in small doses, all detail being dealt with by pamphlets devoted to particular branches of the subject, and these should not be too long. He believed in the lady canvasser, and in fitting stoves on approbation for a thirty days' trial; and he dealt at length with various methods of "catching" new customers. He did not count upon the help of ironmongers or other outside tradesmen, and advocated liberal dealing, free services, free meters, connections, selling appliances at a loss, and taking proper means to instruct the customer how to obtain the best results. A gas-stove in constant operation was there for good or ill, and would be heard of in many other places, either by good report or bad; and it was most important to see that every appliance sold was a good standing advertisement. He employed a qualified lady to follow up all cooking-stoves sent out, and see that the use of them was properly understood. Circulars for architects and builders were also useful. A very common mistake was to limit the expenditure on the selling department to the balance available from the revenue account after paying dividends. He did not advocate charging these expenses to permanent capital; but it was possible to make a suspense account, and often it happened that much more good would be done by spending at once as much as would be spent in five years under the usual policy—thus promptly securing the full increment of new business. The Association might take the proper steps for ascertaining the various purposes for which gas was used; and such information placed in each member's hands, would be a further means of increasing the sale of gas.

The President called upon Mr. Moses to open the discussion. Mr. Moses said that in New Jersey they had no particular season, but sold gas-stoves all the year round, using all means of advertising. He could not say which was the best, but took care to keep before the public all the time. At Trenton, a city of over 60,000 population, they were at the present time selling 18 or 20 gas cooking-stoves a day, and sold 2500 in the year 1900. He sold at cost, and on the instalment or any other plan that would suit the customers. He sold stoves for $10 cash, or $3 down and $1 a month for eight or nine months, and had no trouble in disposing of second-hand or returned stoves. The President said that in Boston they sold stoves at cost on the instalment plan, or at less than cost for cash; and they believed in advertising freely, but with judgment, for it was no use advertising a thing that was not wanted. They also canvassed the architects and builders of all new houses. With regard to second-hand stoves, they sold readily at a reduced price; and there was no loss on them. He agreed with the author that it was better to make a special push at one time, rather than to fritter away strength by extending operations over a series of years. A Committee of three was then appointed, with the author as Chairman, to act upon the suggestion offered at the end of the paper.

(To be concluded.)

THE BURRATOR WORKS FOR THE WATER SUPPLY OF PLYMOUTH.

This was the title of a paper read by Mr. EDWARD SANDEMAN, M.Inst.C.E., at the meeting of the Institution of Civil Engineers last Tuesday week.

The author stated that the water-works of Plymouth dated from 1590, in which year Sir Francis Drake (under powers conferred by an Act of Parliament of 1585) had commenced to build a weir on the River Mewe or Meavy, and to excavate an open watercourse or leat from the weir to Plymouth, a distance of 10½ miles in a direct line, but 18¾ miles along the route taken. The drainage area above the weir was 4885 acres. The work had been completed, and water had been brought into the town, in April, 1591. Water taken from the river by this means had supplied the town for 300 years. The open watercourse, however, was liable to be blocked in times of snow and frost; and for this reason, and also because the increased population demanded a larger and more certain supply, various schemes had been promulgated for the storage of flood-waters and the protection of the leat. In 1891, the author was appointed Water Engineer; and a few months later he presented a report, which was adopted, advocating the building of a storage reservoir and the substitution of a line of pipes for the open leat. By the new scheme, the drainage area was increased from 4885 acres to 5360 acres. Nearly the whole watershed lay on the granite formation, a small portion on the west side being on the Upper Devonian. The rainfall was 58 to 60 inches annually; and an interesting feature of the gathering-ground was the unusually high dry-weather flow that has resulted from it.

The Burrator reservoir was formed by two dams; one of masonry across the narrow gorge through which the River Meavy flowed, the other of earthwork lying between two hills—Sheepstor and Burrator. The greatest depth of water is 77 feet; and the area covered by water is 117 acres—the quantity of water impounded being 657 million gallons. The masonry dam (called the Burrator dam) was built of large rough blocks of granite in cement in the interior, and faced with irregularly coursed granite on both sides. From bottom of foundation to coping of parapet wall, the height is 145 ft. 6 in. A roadway, 18 feet wide, is carried over this dam on five segmental arches of 25 feet span. The earthen dam is remarkable for the fact that its construction involved the cutting of a very deep trench for the foundations, although the dam has to withstand but a small head of water. The trench was cut through decomposed granite to a depth of 105 feet in the centre, although the depth of water against the dam is only 17 feet. This trench is interesting on account of the peculiar geological features met with. The water-tight core of the dam is of concrete (5 feet in thickness) to within a few feet of the ground-level, and of clay from that point upwards.

Water is drawn from the reservoir through two pipes, 36 inches and 25 inches in diameter respectively, laid in a 10-feet culvert built in the masonry dam. There is no valve-tower. There is a specially designed valve to close the mouth of each outlet-pipe, worked by gun-metal rods and chains from a chamber at the top of the dam, in addition to sluice-valves in duplicate in a valve-chamber on the lower side of the dam. The water drawn for consumption is passed through screen-chambers before entering the pipe leading to the service reservoirs. The flood-water running to waste is measured over a weir, 50 feet wide; the height of the water over the weir being recorded on a drum turned by clock-work. The compensation water is measured by an orifice gauge placed immediately below the weir. The water supplied to the town is measured over a gauge-weir 12 feet wide, after which it passes through a 25-inch Venturi meter, which automatically records the flow on a diagram.

The pipe-line, which was laid in lieu of the old leat, is 4½ miles long. The pipes are 25 inches in diameter, and are capable of delivering between 8 and 11 million gallons of water per day. The pipe-line was completed in May, 1894, and the reservoir and other works in June, 1899, at a total cost of £178,000.

Maps and Plans Relating to the Metropolitan Water Supply.—The maps, plans, and diagrams to accompany the minutes of evidence given before Lord Llandaff's Commission on the Metropolitan Water Supply were issued as a Blue-book last Friday. There are 13 maps, 67 plans, and 27 diagrams. The first map is of the County of London, Water London, and Greater London, and it shows the area supplied by the eight Metropolitan Water Companies, with their intakes, works, and principal mains; the next eight show the parliamentary boundaries of the Companies; the following two relate to the Welsh scheme of the London County Council; the next is a map of the Thames storage scheme; and the last shows the average charges of the Companies per pound of rateable value. The whole of the plans refer to the Companies' works; and the diagrams are reproductions of those handed in, in the course of the inquiry, by Sir Alexander Binnie, Mr. R. E. Middleton, Mr. Walter Hunter, Mr. Charles Hawksley, Sir William Crookes, and the late Sir Edward Frankland. The book constitutes probably the most valuable addition which has ever been made to the somewhat voluminous literature connected with the water supply of London.

Paris Gas Company.—According to the report presented by the Directors of this Company at the annual general meeting on the 28th ult., there was an increased consumption of about 847 million cubic feet of gas last year, compared with 1899, owing in a large measure to the Exhibition. In 1867, the additional consumption was 503 millions; in 1878, it was 732½ millions; but in 1889, it was only 512 millions. The revenue last year amounted to £3,569,698, against £3,305,230 in 1899. The result of the working was a net balance of £764,000, half of which (£382,000) goes to the City of Paris. Last year their share was £303,000; so that they net an additional £80,000, in round figures, as the result of the Company's increased business. The amount available for distribution allowed of the payment of a final dividend of 48 frs. 50 c. per share; making, with the interim dividend of 12 frs. 50 c. paid in October, a total of 61 frs. per share. With regard to the negotiations which, as our readers are aware, have been going on with the Municipality on the question of the reduction of the price of gas, the Directors remark that since the 27th of June last they have endeavoured to come to a satisfactory agreement with the City on the matter; and though it is for the present in abeyance, the representatives of the Company are willing to resume its consideration whenever they are invited to do so.

REGISTER OF PATENTS.

Incandescence Bodies or Media for Gas Lighting.—Knöfler, O., of Charlottenburg, near Berlin. No. 5366; March 21, 1900.

This invention relates to: (1) An incandescence medium containing a mixture of 93 per cent. of thorium oxide and 7 per cent. of cerium oxide. (2) A composite thread for an incandescent mantle containing the above admixture in some threads and pure thoria in others. The patentee expressly disclaims Duncan's patent No. 6919 of 1899.

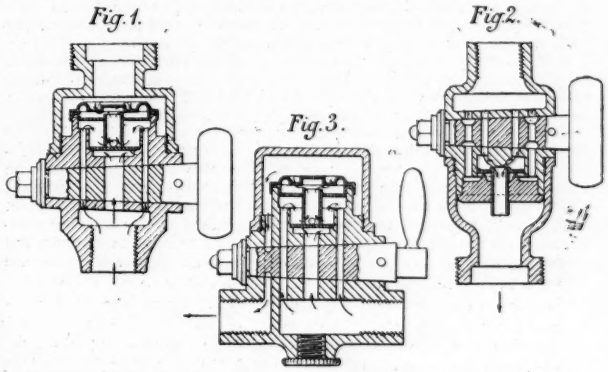
In his specification, he says: According to the views now prevailing among gas-lighting experts, the most favourable mixture of rare earths for ordinary incandescent gas lighting is one containing about 99 per cent. of thorium oxide and 1 per cent. of cerium oxide, as recommended by Auer von Welsbach. I have found, however, that a greater yield of light can be obtained with about 93 per cent. of thorium oxide and 7 per cent. of cerium oxide; but for attaining a favourable result, the weight of such an incandescence body should only be about 0·1 gramme. If the weight is increased beyond this limit, while the ratio between thoria and ceria remains constant, the colour of the light radiated by the incandescence body becomes more and more yellow; and an incandescence body, of ordinary weight (0·6 gramme), and containing the usual proportions of thorium and cerium oxide, would yield an excessively yellow light. It would be difficult, if not impracticable, to produce incandescence bodies of such small weight in such a manner that, while possessing sufficient durability, their surface is as large as usual, and as has been found necessary for ordinary incandescence burners. But the desired result can be obtained easily by incorporating the mixture of thoria and ceria specified above with one or more filaments or fine threads (of combustible material as usually employed for incandescence mantles), uniting these threads with threads containing pure thoria, and then forming from this material hoods or mantles in the known manner, which hoods or mantles are subsequently burnt to ashes, so as to form an incandescence medium composed of two different media or bodies closely interwoven or interlaced with each other—that is to say, one chiefly consisting of thorium oxide alone (which has been found to be practically non-luminous), and one chiefly consisting of a mixture of thorium oxide and cerium oxide in the proportion of about 93 to 7. My assumption, that the individual threads of different kinds are only in mechanical juxtaposition, even after the incandescence hood has been in use for several thousand hours, may be readily verified by a magnifying glass.* When the mantle is in a state of incandescence, the threads containing thoria free from other earthy oxides, shine with the well-known bluish-white light, while the threads containing ceria appear decidedly yellow. Further experiments have shown that, under certain conditions, these composite incandescence media surpass the ordinary incandescence bodies containing the oxides of thorium and cerium in the proportions of 99 to 1, both as regards constancy of illuminating power and stability in the flame. This fact may be explained in the following manner: It is well known that pure thorium oxide is the most difficultly fusible among all known oxides. Every foreign admixture (including that of cerium) reduces its resistance to fusion. It follows that pure thorium oxide is an ideal support also as regards stability, that the incandescence body produced as described above must have a maximum stability in the flame, and the support cannot change its shape; and as consequently the fine thorium-cerium threads (which are the more luminiferous, but the less stable) cannot change their positions, and are always held in the hottest part of the flame, the luminosity will be as constant as possible. A further advantage is that the pure thorium oxide threads radiate very little heat—probably owing to their small heat capacity, which is far less than that of any other known oxide, and especially that of cerium oxide. But they promote the emission of light, due to the special composition and exceedingly fine distribution of the thorium-cerium threads. These phenomena show themselves more clearly if the thorium also is used in the shape of exceedingly fine filaments or threads, which are preferably twisted together or entwined with the fine thorium-cerium filaments.

Gas-Governors.—Goodson, J., of Maze Pond, S.E. No. 6916; April 12, 1900.

This invention is an improvement on patents No. 24,293 of 1898 and No. 9504 of 1899; the gas-supply cock being formed integral with the body of the governor, and, instead of being connected with the diaphragm chamber by means of a single passage communicating with the underside of the floating diaphragm, and through suitable perforations with the diaphragm chamber, it is provided with two or more passages—one in communication with the underside of the diaphragm while other passages are in communication with the upper side; but all open and close approximately simultaneously.

Fig. 1 shows a governor suitable for connecting to a vertical pipe with an upward current gas supply. Fig. 2 is a governor modified to suit a downward current of gas supply. Fig. 3 is a vertical section of a gas-governor suitable for connecting to a horizontal supply-pipe.

In fig. 1, the body part is provided with a screw-threaded socket for connecting it to the gas-supply pipe, and with a bored cylindrical chamber in which works a floating diaphragm having a central tube working freely in a guide diaphragm fitting into the upper part of the chamber, and being surmounted by a cap having perforations for the passage of gas to the burner. A covering cap is screwed to the body, and is screw-threaded at its outer end for the purpose of securing it to the outlet gas-pipe. The gas-regulating cock comprises a plug working in the barrel integral with the governor casing or body proper, and having corresponding passages through the plug and barrel communicating with the under and upper sides respectively of the diaphragm. When the gas-supply cock is opened, the gas is in communication with the underside of the diaphragm through the larger passage, and with the upper side through the smaller passages and chamber; and it passes thence to the burner. So long as the supply pressure keeps normal, the float remains in its lowermost position, admitting a full supply of gas to the burner; but should the pressure be increased, it acts on the underside of the float and raises it, thereby causing the upper orifice of the tube to approach a recess in the cap of the upper chamber and throttle the supply until the pressure is reduced to the normal.



In fig. 2, the gas enters the upper part of the casing and communicates through passages with the underside of the floating diaphragm, and also with the upper side through passages, and travels thence to the burner. The orifices of the passages in the plug are enlarged, in order to ensure full communication between the gas supply and the underside of the diaphragm so long as the passages are open. In the arrangement shown in fig. 3, the gas enters the horizontal inlet and passes upward to the underside of the diaphragm (as in fig. 1) into the upper chamber and thence through the horizontal outlet to the burner.

Gasifying Bituminous Fuel and Recovering Bye-Products.—Naef, P., of New York. No. 6924; April 12, 1900. Date claimed under International Convention, Sept. 14, 1899.

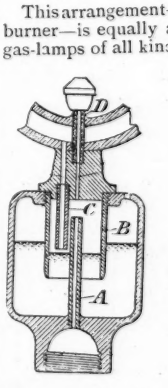
This is yet another of the "inventor's" long series of patents. The present invention relates to the use of bituminous fuel and the recovery of bye-products—such as ammonia, cyanide, and tar-oils—from furnaces used for the production of metals, the calcination of limestone and cement, and for other purposes. The objects of the invention are: "To reduce the volume of gas which has to be treated for the recovery of bye-products; to facilitate the use of fine material in such furnaces; to reduce the pressure necessary for forcing gas through such furnaces; to recover cyanides; to obtain some gas of high heating and also of illuminating power; to produce tar-oils of considerable purity and constant composition as bye-products; and to devise improved methods for treating the gases containing the bye-products."

The means suggested consists in effecting the operations in such a way that the bye-products are contained in a small volume of gas, and can easily be recovered. The process is to be carried out in revolving furnaces. The material is mixed with bituminous fuel, and passed successively through a number of such furnaces; air being conducted into the lowest furnace. The hot gases of combustion pass in the opposite direction upwards. But through the highest furnace, only such gas is passed as is required to distil the fuel; and this gas is treated separately for the recovery of bye-products. In most cases, it will prove economical, says the patentee, to pass the bituminous coal required by itself through the highest furnace, and conduct hot gas through the same, and wash the gas from it separately. The coked fuel from the upper furnace passes continuously with the material into the lower furnaces; air being injected into the lowest furnace. If one large revolving furnace is used, the method can be so varied that most of the gas is withdrawn from a central pipe, which reaches some distance into the furnace from the charge-end. The rest of the gas travels through the furnace to the end, distilling the coal, and is withdrawn at the charge-end and treated for recovery of bye-products.

A further method is to arrange a number of pipes in the end of the furnace at which the material enters. The fuel is charged into these pipes; the material into the surrounding pipes. The gases of combustion pass through the spaces between the tubes, and leave separately. The gases from the tubes are conducted to washing apparatus.

Automatic Bye-Passes for Gas-Fittings.—Forbes, C. S., of Strathdon, N.B. No. 8675; May 10, 1900.

This arrangement—though specially designed for use with an acetylene burner—is equally applicable for use with chandeliers, brackets, and gas-lamps of all kinds.



Applied to an acetylene burner, the invention is shown in the engraving. It consists of a cup containing mercury with a socket below to fit on the gas-supply pipe. A small tube A conveys the gas into the bottom of the mercury-cup, and, extending upward, terminates above the level of the mercury. The top of the cup has secured to it an inverted bell B, of smaller diameter than the cup, the lower edge dipping beneath the level of the mercury. The quantity of mercury in the cup is such that, when the gas is turned on at full pressure, the mercury is forced down below the end of the tube C, thus allowing the main burners to be lighted; the bye-pass D being already alight. When the pressure is reduced by partly turning off the tap to (say) 2 inches, the tube C is sealed by the rising of the mercury, and the bye-pass only remains alight.

Internal Combustion Engines.—Xörting, E., of Hanover. No. 11,038; June 18, 1900.

This invention relates to internal combustion engines in which the charge introduced into the cylinders at the end of the outward, or at

* This was clearly shown by the illustrations accompanying the second of the series of Cantor Lectures delivered by Professor Lewes to the Society of Arts last year. See "JOURNAL," Vol. LXXV., p. 1362.

the beginning of the inward, stroke removes the residues of combustion of the preceding power stroke.

The charge is, as it enters the cylinder, given a whirling and revolving motion, more or less at right angles to the axis of the cylinder, and in such a manner that, so far as practicable, it is "maintained in a coherent mass, and is prevented from radiating and becoming mixed with the residues of the previous power stroke."

It is, however, absolutely necessary, says the patentee, that a layer or stratum of inert gas (air) should be located between the still glowing residues of the previous explosion and the new charge; so that the latter does not ignite by contact with the residues. It is also necessary to provide special means whereby the quantity of the charge may be altered without affecting its location, or altering its composition, whenever the load on the engine varies. It is also desirable to provide valve mechanism for the admission of the charge into the cylinder, which acts at very short intervals of time and as noiselessly as possible. And, finally, a special device is requisite by means of which the combustible charge (which in these engines varies as regards location and volume according to the load), is made to burn completely and with sufficient rapidity.

Fig. 1 is a longitudinal section and a plan of a double-acting engine. Fig. 2 is a section of the inlet-valve and baffle-plate on the concave side of the combustion chamber. Fig. 3 shows the application of the disc-valve to the cylinder of the engine. Fig. 4 shows the gas-pump. Fig. 5 shows the inlet-valve movement.

D D^1 are trumpet-shaped, curved combustion chambers provided at both ends of the cylinder A, and fitted with admission-valves E E^1 pressed against their seats by springs. The periphery of the middle part of the cylinder is provided with a plurality of exhaust-ports S opening into a passage connected to the exhaust-pipe. Underneath the valves, and on the concave side of the trumpet surface, are arranged baffle-plates L L^1, preferably having the shape of ring sectors; and near the inlet-valves and the end of the cylinder are the igniters T T^1. The air is supplied to the valve-chamber by the air-pump N, through pipes O O^1 and openings F F^1; while the gas is delivered by the pump M, through the pipes P P^1 and openings G G^1, to the valve chamber. R is the throttling-valve disposed in the gas-supply pipe and actuated by the governor.

The operation of the engine is as follows: As soon as the working piston B uncovers the ports S, the burned charge escapes, and the

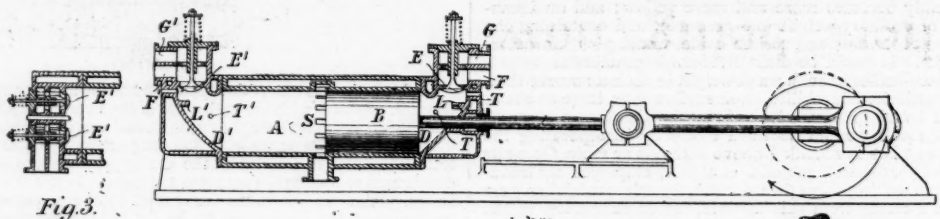


Fig. 3.

Fig. 1.

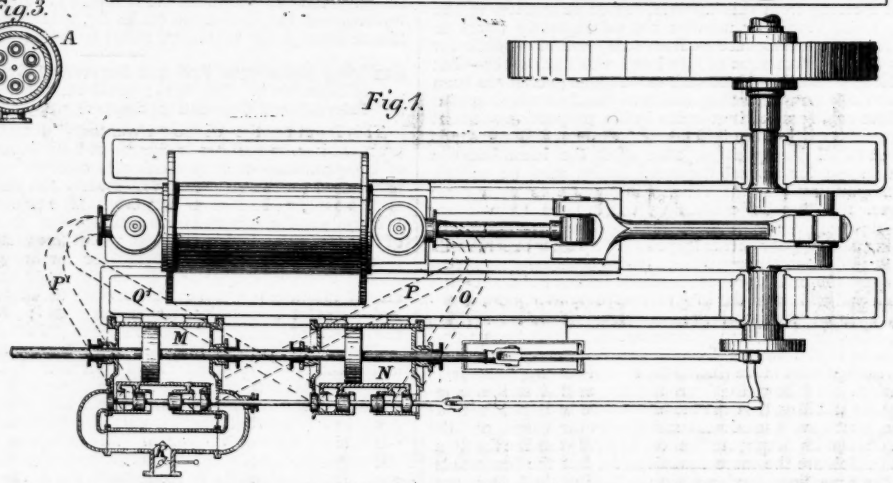


Fig. 4.

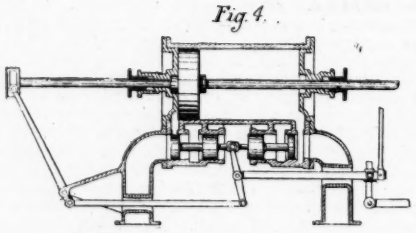


Fig. 2.

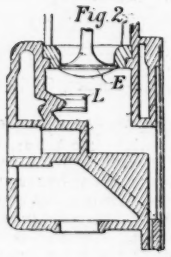
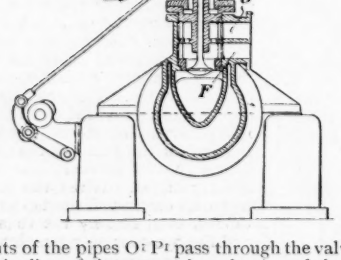


Fig. 5.



compressed contents of the pipes O^1 P^1 pass through the valve chamber E^1 (in which the mingling of the gases takes place), and then enter the combustion chamber through the valve C^1, which opens automatically. The action of the pumps is so regulated that their pistons are in or near the dead-points of their inward stroke when the engine piston covers again the ports S on beginning its in-stroke. The whole of the compressed charge must therefore be delivered into the combustion chamber during the short time the ports S remain uncovered; and at the same time the products of combustion must be swept out of the cylinder. As the air-pump starts compressing the air immediately the in-stroke begins, and as the gas-pump begins to compress the gas at a later period, the air-pump forces a part of the air through the chamber of the valve E^1 into the pipe P^1; so that, on the valve E^1 being opened, pure air is delivered into the engine cylinder through both pipes O^1 P^1. After the air forced into the gas-supply pipe has arrived in the engine cylinder, and while the pistons of both pumps are completing their stroke, air from O^1 and gas from P^1 pass into the chamber of the valve E^1; the gas entering by the inlet G^1 and the air by the inlet F^1, in which chamber a perfect mingling of the gases is insured. As soon as both pump pistons reach the end of their stroke, the valve E^1 closes automatically under the action of its spring. The gases through the valve E^1 impinge partly against the baffle-plate L^1; and being thereby deviated from their original direction, unite with the other part of the inrushing gas, and form a current of gas which revolves or whirls on itself. This current, consisting first of a stratum of pure air and then of a combustible gaseous mixture, sweeps the residues of the previous explosion through the ports S. The charge is then compressed by the in-stroke of the piston and ignited. While these operations take place on the one side of the piston, the other side accomplishes its power-stroke, followed again by the working phases just described. The cooling of the charge during the compression is effected by ribs provided on the internal walls of the combustion chamber, by which the refrigerating effect of the cooling medium circulating around the combustion chamber is transmitted towards the centre.

Water-Pressure Indicators.—Lake, H. H.; a communication from the Luxsche Industriewerke, of Ludwigshafen-on-the-Rhine, Germany. No. 22,578; Dec. 11, 1900.

This invention relates to an instrument for automatically registering or recording variations of pressure existing in water-mains, and for signalling when the pressure falls below the normal or standard.

Fig. 1 (p. 1003) is an elevation of the registering and signalling instrument and (in the lower part of it) of the branch-conduit provided with the device embodying the invention. Fig. 2 are details. Fig. 3 shows a recording table or sheet with a line A—B as heretofore marked by the pen, and a second line C—D marked by the pen in accordance with the present invention.

The registering and signalling instrument shown in the upper part of fig. 1 is of any well-known construction, and consists of a scale-tube A connected to the branch-conduit by the aid of the interposed vessel or chamber B and an intermediate pipe C. The scale-tube is open at

its upper end, so that the mercury contained in B can freely rise in A under the action of the water passing from the main conduit D through the branch conduit, into the intermediate pipe C, and pressing upon the surface of the mercury contained in the vessel. In accordance with the variations of pressure exerted upon the mercury in conformity with that existing in the main conduit, the surface of the mercury in the scale-tube rises or falls, and the index-rod E within the scale-tube correspondingly rises or falls, and transmits its movements, by a cord running over a pulley under the action of a weight, to the recording pen I.

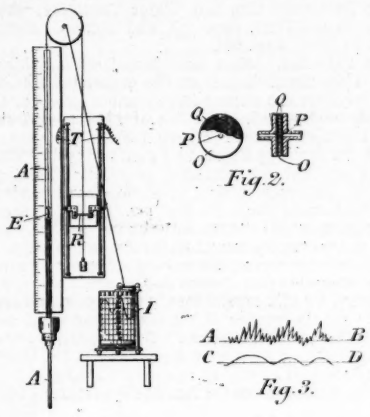
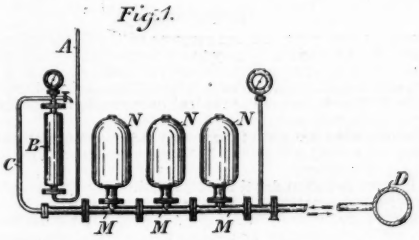


Fig. 1.

Fig. 2.

Fig. 3.



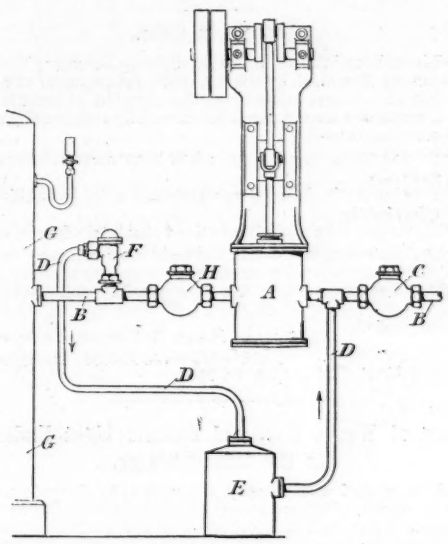
All the parts so far described are well known. The present invention consists in providing a certain resistance in the branch-conduit for the purpose above indicated. To this end a single-flanged pipe M, having an air-vessel N thereon—or several such pipes—is inserted in the branch-conduit (see fig. 1, lower part); each air-chamber freely communicating with its carrier or pipe M. A metallic disc O, provided with a fine central bore P, and covered on either side by a sheet of wire gauze Q, is embedded between the adjacent flanges of the pipes; so that the water will flow from one pipe to the adjacent one, and the variations of pressure in the main E therefore will slowly be transmitted to the vessel A and the registering instrument—avoiding all the momentary variations of pressure to be recorded or signalled. This object is attained by the use of the air vessels in combination with the perforated discs O—the wire gauze serving the purpose of preventing mineral or organic impurities of the water from choking the passage P.

As illustrated by the recording line A—B in fig. 3, all the momentary variations of pressure having a push-like character have been recorded heretofore in the registering instrument; and frequently, but unnecessarily, the index E descended below the standard, causing the weight to lift the lever R so as to send an electric current from any suitably arranged electric source, through the circuit T, to the alarm-bell located at the water-works. In the case of the present invention, however, the recording line has a more even appearance (see line C—D, fig. 3), and the bell at the water-works is not operated except in case of need—that is to say, as soon as the abnormal pressure in the main-conduit continues to exist for a longer period, and hence is of practical importance.

Pressure-Regulating Devices for Gas Installations.—Boult, A. J.; a communication from the Société Lumière Boule, of Brussels. No. 3297; Feb. 15, 1901.

This invention relates to means for counteracting excess or variable pressure in the supply-pipes for gas-lighting purposes, where the burners are fed with gas kept under constant high pressure by a compressor. In such arrangements (intended for a limited number of burners) there often arises, says the patentee, an undesirable over-pressure in the reservoir when some of the burners are extinguished, since the compressor continues its uniform action. Up to the present, "such excess has been counterbalanced by the arrangement of a suitable safety-valve, through which the excess gas is allowed to run to waste in the air, or precautions have had to be taken, and a strict watch kept over the plant, so as to be able to disengage and again re-engage the compressor or pump, according to requirements." The object of the present invention is to counteract any undesirable excess pressure by the arrangement, in connection with the compressor or pump, of a return-branch tube, which becomes effective, and cuts off or reduces the gas supply, whenever the pressure in the main reservoir reaches a certain point; while the order of action is re-established directly the pressure falls below that point.

For this purpose, a valve C is interposed between the compressor or pump A and the gas-supply pipe; while a pipe D branches off from the connection between the valve and the pump, and which, after communicating with a large reservoir E, communicates with an excess-pressure valve F, communicating with the pipe leading from the pump to the high-pressure reservoir G, from which the burners are supplied. Thus, whenever the pressure in the reservoir G exceeds a certain limit, the excess-pressure valve F will be opened; while, in consequence of the pressure now rapidly extending along the branch-conduit or circuit D, it will act on the valve C and shut it—thereby closing the communication between the supply-pipe and the pump. The latter will now draw in gas from the reservoir through the pipe D, and force it, by way



of the high-pressure valve F and the other branch of the pipe D, back into the reservoir E. Thus the pump works in a circuit, along which a constant quantity of gas travels, being drawn through part of it by the sucking action and driven through the other part by the forcing action of the pump, until the pressure in the reservoir G falls below the limit assigned for it, in consequence of which the excess-pressure valve will close again, relieving the valve C, which reopens on the next suction stroke of the pump piston. A second valve H is interposed on the connection between the high-pressure reservoir and the pump only, to balance the pump-valves.

APPLICATIONS FOR LETTERS PATENT.

6776.—Rowbotham, W. & K. A., "Gas-engines and the like." April 1.
6860.—Richardson, C. G., "Incandescent gas lighting." April 2.
6861.—Lambourne, W. T., and Wood, J. C., "Acetylene generators." April 2.
6904.—Thiersant, H. de, and Coulson, W. A., "Generating acetylene gas." April 2.
6915.—Lake, W. R., "Internal combustion engines." A communication from J. A. M'Lean. April 2.
6920.—Booth, J., and Dugard, W. F., "Suspension gas lamps, chandeliers, and brackets." April 2.
6952.—Janz, J., "Burning down incandescent mantles." April 2.
6957.—Stern, S., "Lighting lamps or gas." April 2.
7000.—M'Callum, A., "Incandescent fire." April 3.
7043.—Enock, A. G., "Compressing gas." April 3.
7055.—Flint, W. P., "Gas-engines." April 3.
7080.—Smith, W. H., "Gas and oil engines." April 4.
7135.—Hughes, W. C., "Acetylene-gas generator." April 4.
7161.—La Société Industrielle des Compteurs, "Gas-meters." April 4.
7180.—Kitson, A., "Gas-burning apparatus." April 4.
7188.—Beck, C. W., "Acetylene generators." April 4.
7206.—Newbigging, E. L., "Gas or other cocks or taps." April 6.
7234.—Watson, S. G., "Acetylene generators." April 6.
7238.—Hoffmann, P., "Incandescent gas-lamps." April 6.
7244.—Aird, K., and M'Pherson, D., "Atmospheric gas-burners." April 6.

Sales of Shares and Stock.—Messrs Margetts and Sons recently sold by auction some £50 shares in the Warwick Gas Company for £146 each; and some £20 "A" shares in the Leamington Priors Gas Company, for £47 10s. each. Stock of the Gosport Water Company was sold a few days ago at prices ranging from £16 to £17 per £10 of stock. A parcel of £587 of 5 per cent. maximum ordinary stock of the Hartlepool Gas Company sold a few days ago for £748.

The Dangers of Gas-Heated Baths.—An accident of a distressing nature occurred last Tuesday at Brockley, when two brothers were suffocated by the fumes arising from a geyser used to heat a bath. The victims were Edward Kidner, aged 25, a butcher's manager, and Percy Kidner, aged 15, who lived with their mother at No. 40, Brockley Road. The bath was in a corner of their bedroom, and at half-past six in the morning the young men were moving about. As they did not come down to breakfast at eight o'clock, Mrs. Kidner went to their room, but failed to get a reply, and could not succeed in opening the door, as a chair had been placed against the handle inside. Obtaining assistance, she forced the door open, and found her sons lying on the bed dead—the elder brother having evidently taken his bath. The room was full of steam. Two doctors were summoned, but efforts to restore animation proved fruitless. They stated that death had been caused by suffocation. At the Coroner's inquest last Thursday, a former occupant of the house said he had had trouble with the fumes, although he did not think there was any danger. The doors and windows of the house had to be kept wide open while the geyser was alight. It was an old-fashioned apparatus, and the bath took more than half-an-hour to heat. A verdict of "Accidentally poisoned" was returned.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

Arsenic in Coke.

SIR,—I have been in communication with the Secretary to the Royal Commission on Arsenical Poisoning, with reference to the evidence given before that Commission upon the question of arsenic in coke; and the Commission have desired the Association to give evidence upon the following points:—

(1) The amounts in which arsenic has been met with in samples of gas coke.

(2) The variations in different gas coals and coke in liability to contain arsenic.

(3) Whether gas coke could be obtained absolutely free from arsenic.

Will you, therefore, allow me, through your columns, to ask Gas Companies who supply coke for malting purposes to have their coke analyzed, and send me—with the least possible delay—the original analyses thereof, which, of course, I will undertake to return in due course if required.

FRED. E. COOPER, Secretary,
Gas Companies' Protection Association.

5, *Victoria Street, S.W., April* 12, 1901.

Statistics of Water, Gas, and Electric Light Undertakings in the United States.

SIR,—I have read with interest the notice, in the "JOURNAL" for the 12th of March, of the report of the United States Commissioner of Labour upon water, gas, and electric light undertakings in the States; and I beg to differ from you in your conclusions as to the value of the information presented, which is mostly for the year 1898. The report is dated November, 1899. By comparing some of the data as to process, outsend, street-lamps, &c., with Brown's "Directory of Gas Companies," and with files of the American gas papers, it is not hard to recognize most companies under their serial number designations.

In doing some figuring from the information tabulated in the report, I will quote a few data, which may be of interest. They concern (A) 17 companies with outsends of 50 to 75 million cubic feet per annum; (B) 9 companies with 75 to 100 millions per annum; (C) 18 companies with 100 to 500 millions per annum; and (D) 8 companies with more than 500 millions per annum.

	Average Outsend. Millions.	Average Holder Capacity. Thousands of Cubic Feet.	Percentage of Maximum Outsend for 24 Hours.	Average Miles of Mains, All Sizes.	Average Number of Meters.
A	61	310	100	32	2,630
B	87	610	140	54	3,360
C	205	1050	102	81	7,400
D	2233	6300	56	392	61,100

	Average Number of Meters per Mile of Main.	Average Value of Each Meter.	Average Value of Each Mile of Main.	Average Value of Each Thousand Feet of Holder Capacity.	Average Outsend per Meter. Cubic Feet.
A	82	$8·17	$3905	$155	23,200
B	62	7·50	3400	118	26,000
C	91	6·00	3700	125	27,700
D	157	9·95	9000	181	36,620

	Average Outsend per Mile of Main. Cubic Feet.	Average Leakage. Per Cent.	Average Gas Used at Works and Offices. Per Cent.	Average Values in Thousands of Dollars. Buildings.	Apparatus.
A	1,507,000	12·8	1·0	40	82
B	1,610,000	14·0	1·5	43	104
C	2,530,000	8·7	1·0	96	170
D	5,690,000	7·3	1·3	1,343	1,590

	Average Values in Thousands of Dollars. Mains.	Land.	Meters.	Incidentals.	Average Selling Price of Gas.
A	125	25	21	4	$1·44
B	180	30	25	3	1·27
C	300	93	44	2	1·16
D	3564	2000	598	133	1·12

	Average Cost per Thousand Cubic Feet Sent Out. Cents.	Average Cost per Thousand Cub. Ft. Sold. Cents.	Costs in Cents per Thousand Cubic Feet of Gas Sold. Salaries, Clerks, Office Expenses, and Insurance.	Wages.	Materials.
A	71	81	13	13	33
B	74	86	12½	15	32
C	67½	74	9½	14½	27
D	60	64	6	12	25

	Average Cost in Cents per Thousand Cubic Feet of Gas Sold. Distribution Expenses.	Repairs to Works.	Repairs to Mains.	Other Repairs.	Taxes.	Depreciation.
A	7	3	3	2	5	20
B	5	3	3	3	4	18
C	3	2	3	2	6½	18
D	5½	1¾	2	1½	6	9¾

The average profits would pay 5 per cent. on a capitalization of the following amounts:—

	Per Million Cubic Feet Sent Out.	Per Meter.	Per Mile of Main.
A	$6000	$137	$4,250
B	5000	130	8,150
C	7500	208	19,000
D	6700	245	38,200

The actual values underlying the above capital—the balance being the value of the franchise—is as follows: (A) 93 per cent.; (B) 104 per cent.; (C) 56 per cent.; (D) 69 per cent.

March 24, 1901. JUNIOR.

The Need for Reform in the Model Auction Clauses.

SIR,—Referring to the letter on the above subject in the "JOURNAL" for the 2nd inst., I would suggest the inclusion of other model clauses now in use, which I think would strengthen the position. Take, for instance, the Pontypool Gas and Water Company, which was incorporated in 1873 (36 Vict., cap. 57), and obtained further powers in 1890 (53 and 54 Vict., cap. 68).

Under the 1873 Act, shares were issued with dividends limited to 7 per cent. Thus the dividends on the original shares were limited to 10 per cent., and on the shares issued under this Act to 7 per cent., which is easily understood. The Act of 1890, passed seventeen years afterwards, contains a model clause (28) which practically reduces the dividends on the 1873 shares to £4 4s. per cent. Thus, after being entitled to £7 per cent. for seventeen years, the shares are reduced to £4 4s. per cent. for recent years. The old shares receive £6 now, and have never had more than £7 10s. per cent. It appears very unjust that a modern model clause, introduced in 1890, should alter the condition of shares legally issued under the Act of 1873.

The Act of 1890 authorizes the raising of capital for water purposes only (see the preamble and clauses 40 and 42). Yet the Company put the profit earned by this capital into hotch-potch, and divide it accordingly. Last year the profits of the Gas Department were £2 17s. 3d. per cent., but the gas shareholders have received 6 per cent.—the difference being made up by the profits on the Water Department; and this in face of sections 40 and 42 of the Act of 1890.

I append the clauses from the Act of 1890 referred to above.

Birmingham, April 8, 1901. GEO. EDWARDS.

[APPENDIX.]

28.—In case in any year the net revenue of the Company applicable to dividend shall be insufficient to pay the full amount of the maximum dividend to which each class of ordinary shares or ordinary stock in the capital of the Company is entitled, a proportionate diminution shall be made in the rate of dividend then to be paid in respect of each class. [Can this apply to shares issued seventeen years before?]

40.—From and after the 31st of December, 1890, the accounts of the Company relating to gas and water shall be kept and returned for all public purposes as separate accounts.

42.—All monies raised under this Act, whether by shares or stock or borrowing, or by debenture stock, shall be applied only for the water-works purposes of the Company to which capital is properly applicable. [Can the revenue earned by this capital be applied to the payment of dividends to the gas proprietors?]

LEGAL INTELLIGENCE.

DEVONPORT QUARTER SESSIONS.—Thursday, April 11.

(Before the Recorder, Mr. H. E. DUKE, K.C.)

The Application for a Reduction in the Price of Gas.

The case, in which Mr. A. B. Filling, the Town Clerk, and Mr. J. F. Burns, the Borough Surveyor, of Devonport, petitioned (as two gas-rate payers) for the appointment of an Accountant, under section 35 of the Gas-Works Clauses Act, 1847, to ascertain the actual state and condition of the concerns of the Devonport Gas and Coke Company, with a view to a reduction in the price of gas, came before the Court to-day. The application was made at the January sittings of the Court (*ante*, p. 148); and Messrs. H. A. Plumb and E. W. Drew, who were, by consent, appointed joint Accountants, now presented their report.

Mr. F. BODILLY and Mr. SOMERS JAMES appeared for the petitioners; Mr. BAGGALLAY, K.C., Mr. W. L. WILLIAMS, and Mr. J. A. HAWKE represented the respondents.

The report of the Accountants was as follows:—

In conformity with our appointment, dated the 11th of January, 1901, we beg to report that we attended at the offices of the Devonport Gas and Coke Company, and there made an examination into its affairs, the result of which is as follows:—

Capital Authorized.

The Company was incorporated by Special Act of Parliament in 1845, with a capital of £20,000, divided into 4000 shares of £5 each, with an authorized maximum dividend of 10 per cent., and borrowing powers to the extent of £6666. A further Act of Parliament was obtained in 1853, whereby the authorized capital of the Company was increased to £50,000 by the creation of a further 6000 shares of £5 each. At the same time the borrowing powers of the Company were increased to £15,000. The wording of the clause authorizing the issue of the further 6000 shares is as follows:—

That the Company may from time to time, with the approbation of three-fifths at least of the votes of the shareholders present in person or by proxy at a general meeting held for that purpose, authorize the issue of the 6000 remaining shares, or any of them, either of one class and with like privileges, or of several classes and with different privileges, and respectively with any fixed, fluctuating, contingent, guaranteed, preferential, perpetual, terminable, or other dividend or interest not exceeding £6 per centum, as the Company from time to time think fit, and may from time to time fix as they think fit the amount and times of payment of the calls on the new shares.

Capital Issued.

The £20,000 authorized by the Act of 1845 was raised in the years 1845 and 1846 by the issue at par of 4000 shares of £5 each. On the 30th of July, 1853, the Directors were authorized, by a resolution passed at a general meeting of the Company, to dispose of 3000 new shares of £5 each, on such terms and conditions as they might determine; and, in conformity with such resolution, the 3000 shares were offered to the proprietors upon (*inter alia*) the following terms and conditions: "(*a*) That every proprietor shall be entitled to an allot-

ment, as nearly as may be, in the proportion of three new to four old shares; and also to a like proportional allotment of any new shares which may remain unclaimed. (*b*) That every allottee shall either pay the sum of £6, or, at his option, deliver up two certificates of shares in the Devonport Gas Plant Leasing Company, in exchange for every new share allotted to him. (*c*) That the certificates of new shares be numbered from 4001 to 7000 inclusive; and shall bear date the 1st of October, 1853, from which day the proprietors thereof shall share dividends *pro ratâ* with the proprietors of shares numbered from 1 to 4000 inclusive, and shall possess equal rights and privileges with these proprietors." These shares were all taken and paid up in full during the years 1853 and 1854, and the £3000, representing the premium of £1 per share, was received by the Company, and eventually applied in reduction of the expenditure on plant and works.

On the 21st of November, 1860, the Directors were authorized, by a resolution passed at an extraordinary general meeting of the Company, to issue the remaining 3000 shares of £5 each authorized by the Act of 1853 upon (*inter alia*) the following terms and conditions: "(*a*) That each £5 share shall bear a minimum rate of interest guaranteed at 4 per cent. per annum, and payable half yearly in perpetuity. (*b*) That if and when any dividend exceeding 8 per cent. per annum is declared on the original shares, the holders of guaranteed shares shall participate rateably in the excess until 10 per cent. shall have been paid on the original, and 6 per cent. on the guaranteed shares, so that 9 per cent. on the original will give 5 per cent. on the guaranteed shares, and so in proportion for a greater or less amount. (*c*) That the 3000 guaranteed shares shall be offered to the holders of the 7000 original shares as nearly as may be in the proportion of three guaranteed to seven original shares. (*d*) That the holder of every guaranteed share shall have the same right of voting at all meetings of the proprietors in respect of guaranteed shares as is enjoyed by the holder of every original share in respect of original shares." In conformity with this resolution, the shares were from time to time issued at par over a period extending from 1860 to 1887, when the final payment, making up the full £15,000, was received.

The share certificates issued by the Company in respect of the £15,000 additional capital, issued in 1853 and 1854, are in a like form to those issued in respect of the original capital of £20,000; and in all respects both these issues of shares have been treated by the Company as possessing equal rights and privileges. The share certificates issued by the Company in respect of the £15,000 guaranteed capital, issued from 1860 to 1887, are of a distinctive character, and the conditions of the issue above recited are endorsed upon the back of each certificate.

Dividends.

The original ordinary share capital of £20,000 (Act of 1845) carried a maximum dividend of 10 per cent. From the years 1846 to 1870 inclusive, the dividend paid ranged from 5 per cent. to 9½ per cent.; and from 1871 to 1900, the full maximum dividend of 10 per cent. was paid, without in any case any deduction for income-tax. After adjustment of income-tax, dividends from 1846 to 1870 were underpaid to the extent of £10,539 3s. 10d.; while from 1871 to 1900, dividends were overpaid, by reason of non-deduction of income-tax, to the extent of £1445 16s. 8d.—leaving a sum of £9093 7s. 2d. as the net amount of authorized dividend short paid on the £20,000 original capital from the formation of the Company to the 31st of May, 1900.

The additional share capital of £15,000 (Act of 1853) was issued by the Company as possessing equal rights and privileges with the original share capital. From the years 1834 to 1870 inclusive, the dividend paid ranged from 7 per cent. to 9½ per cent.; and from 1871 to 1900, 10 per cent. was paid—no deduction being made for income-tax. Assuming this capital to be entitled to a dividend of 10 per cent., dividends from 1854 to 1870 were underpaid, after adjustment of income-tax, to the extent of £3213 14s. 3d.; while from 1871 to 1900, dividends were overpaid, by reason of non-deduction of income-tax, to the extent of £1084 7s. 6d.—leaving a sum of £2129 6s. 9d. as the net amount of authorized dividend short paid on the £15,000 additional capital, always provided it is entitled to 10 per cent. Assuming that the limit of dividend on this capital is 6 per cent. instead of 10 per cent., dividends from 1854 to 1900 have been overpaid, after adjustment of income-tax, to the extent of £25,120 17s. 2d.

Under the terms of its issue, the additional "guaranteed" share capital of £15,000 (Act of 1853) carries a minimum dividend of 4 per cent., increasing to 6 per cent. From the year 1861 to 1870 inclusive, the dividend paid ranged from 4 per cent. to 5½ per cent.; and from 1871 to 1900, the full maximum dividend of 6 per cent. was paid—no deduction being made for income-tax. After adjustment of income-tax, dividends from 1861 to 1870 were underpaid to the extent of £768 5s. 6d.; while from 1871 to 1900, dividends were overpaid, by reason of non-deduction of income-tax, to the extent of £592 16s. 9d.—leaving a sum of £175 8s. 9d. as the net amount of dividend short paid on the £15,000 of guaranteed capital.

The total net amount of dividend short paid by the Company from its formation to the 31st of May, 1900, is therefore—

On £20,000 original (ordinary) share capital	£9,093	7	2
On £15,000 additional (assuming 10 per cent.) share capital	2,129	6	9
On £15,000 additional (guaranteed) share capital . . .	175	8	9
Total	£11,398	2	8

While if the £15,000 of additional capital, treated by the Company as part of the ordinary share capital, is only entitled to 6 per cent., the position is as follows:—

Short paid on £20,000 original ordinary share capital . .	£9,093	7	2
Do. £15,000 guaranteed share capital	175	8	9
	£9,268	15	11
Overpaid on £15,000 additional share capital.	25,120	17	2
Leaving a net balance overpaid of	£15,852	1	3

Capital Expenditure.

The total expenditure on capital account to the 31st of May, 1900, as shown by the accounts filed by the Company, was £65,804 9s. 3d.; and in the preparation of an amended revenue account for the year ending the 31st of May, 1900, we have deemed it necessary to increase this figure to £66,528 4s. 2d.—the difference of £723 14s. 11d. being sums representing the further cost of extension of mains, meters, &c., charged by the Company to revenue, and in our opinion chargeable to capital. As referred to in our remarks on the revenue account, it is probable that a proportion of the cost of the new boilers, &c., purchased in 1900 at a cost (exclusive of fixing) of £1151 15s., should be charged to capital; but we were unable to ascertain the cost of the original boilers. We are informed that the capacity of the new boilers is considerably in excess of the old ones; but the proportionate charge to capital should be based on the excess cost, if capable of ascertainment. As referred to in our remarks on the revenue account, it is a question if a part of the expenditure incurred in alterations to the retort-house and coal-store should not be treated as an improvement, and, as such, chargeable to capital.

The works were originally erected on land held on a leasehold tenure, and in 1897 the freehold was purchased for a sum of £8250. No special provision for depreciation of leasehold property was made from 1845 to 1897, and the cost of the freehold, on its purchase in 1897, was dealt with in the accounts of the Company as follows: £4000 was charged to suspense, and ultimately treated as capital expenditure; £1532 16s. 10d. was written off against a renewal fund raised from profits in the year 1894; and £2757 17s. 8d. was charged against the net revenue of the Company for the year ended the 31st of May, 1897. These sums represented the £8250 the cost of the freehold, *plus* £40 14s. 6d. the balance of rent, &c. Apart from the fact that the Company was entitled to provide a fund for the depreciation of leasehold property, the whole cost of the freehold should have been charged to capital.

The records of the Company were insufficient to enable us to make a complete examination of the capital expenditure; but we see that from time to time lump sums have been written off, presumably for depreciation, and in recent years the following sums have been so treated: For the year ending May 31, 1895, £1500; do., 1895, £1500; do., 1897, £1500; do., 1899, £1500. We have made no attempt to correct the expenditure on capital account prior to the 31st of May, 1899, or in respect of the matters before mentioned—*i.e.*, (*a*) proportion of cost of replacement of boilers; (*b*) do. of alteration to retort-house and coal-store; (*c*) do. of purchase of freehold; and (*d*) do. of depreciation written off. The figure shown in our amended statement of accounts to the debit of capital account is subject to the above.

Revenue Account.

We found on examination of the Company's revenue account for the year ending the 31st of May, 1900, that the detailed items under the several heads of expenditure required many alterations and corrections, and we have prepared an amended revenue account, submitted herewith. The most important corrections were as follows:—

The cost of coal carbonized was understated by the Company, by reason of the stock on hand on the 31st of May, 1900, being taken into account at a sum of £836 15s. 1d. in excess of its actual cost. We are also informed that during the year a fire took place in the coal-store, and in consequence the gas-making quality of the coal then in stock was reduced, and the cost of carbonization thereby increased.

The cost of purifying was understated by the Company, by reason of no value having been placed on the spent oxide on hand on the 31st of May, 1899, which oxide was sold shortly after that date, and the whole of the proceeds credited to the year ending the 31st of May, 1900.

The wages paid by the Company are recorded in a wages-book; but it has not been the practice of the Company to properly analyze the same under the usual heads of account. An analysis of the wages paid for the year ending the 31st of May, 1900, has been recently prepared by the Company and handed to us, and we have used this analysis as a basis in the preparation of the amended revenue figures; but, owing to the death of the then Manager, and the time that has elapsed since the wages were paid, we are somewhat doubtful if the allocation now made is in all cases correct, and our figures are therefore necessarily subject to the correctness of the said analysis.

The expenditure charged to repair and maintenance of works during the year ending the 31st of May, 1900, was abnormally heavy, and was as follows:—

(*a*) Cost of two new Lancashire boilers and fittings	£1151	15	0
(*b*) Expenditure on repairs and renewals of retorts, alterations to retort-house and coal-store, and erection of two new chimneys in place of one larger	3255	8	3
(*c*) Repairs to gasholder	338	18	1
(*d*) General repairs and maintenance	729	7	2
(*e*) Wages allocated to wear and tear of works	810	8	6
	£6285	17	0

With regard to sub-heading (*a*), we are informed that the two new boilers were a replacement of two of considerably smaller capacity; and if the cost of the two new boilers was in excess of that of the two they replaced, the excess should be charged to capital. We have, however, no means of ascertaining the cost of the original boilers. The erection of the boilers was not complete on the 31st of May, 1900, and they were not in use till some months after that date. As to sub-heading (*b*), we are informed that the retort-houses contain the following:—

No. 1 house—eight beds of sevens and one bed of fives	61
No. 2 house—twelve beds of eights, throughs (regenerator system) .	192
	253

The Chairman of the Company informed us that the conversion made in No. 2 retort-house to the regenerator system took place some years prior to the 31st of May, 1899, and that the whole of the expenditure on retorts was in the nature of renewals—no increase being made in the number of retorts. This expenditure likewise includes certain alterations to the retort-house and coal-store; and it is possible a proportion of the cost might be taken as an improvement to works, and, as such, chargeable to capital. The cost of the two new chimneys was, we are informed, less than that of the one larger chimney they replaced. As the whole of the above work was more or less proceeding simultaneously under the direction of the late Manager of the Company, and the records are incomplete, we are unable to apportion the cost between the several items referred to in sub-heading (*b*); and it is probable that a proportion of the wages under sub-heading (*e*) should be added to sub-heading (*b*).

We found that many items chargeable under the head of "Repair and maintenance of mains and services" were wrongly allocated in the Company's accounts, and that no charge for extension of new mains and services had been made to capital. We have transferred to capital the cost, so far as we could ascertain it, of all additional new mains and services; leaving the amended figure of £1204 13s. 7d. chargeable to revenue.

As to repairing, renewing, and refixing meters, the practice adopted by the Company appears to have been to charge all meters of 20 lights and upwards to capital, and the smaller sizes to revenue; but occasionally this practice was departed from. We have amended the accounts by charging to capital the cost of all new meters supplied to new consumers during the year ending the 31st of May, 1900.

The sum charged by the Company to revenue account for rates and taxes included income-tax on profits; but in the amended accounts, we have treated this payment as a charge on net revenue.

The balance of profits shown by our amended revenue account for the year ended the 31st of May, 1900, is £3170 15s. 9d.; to which must be added the interest on reserve investments, £151 6s. 11d.—together, £3322 2s. 8d. Deducting the interest on loan capital, bank overdraft, and consumers' deposits, £769 5s. 1d., leaves a balance of £2552 17s. 7d. as the net profit of the Company for the year, subject to the addition thereto of a proportion, if any, of the cost of the new boilers and alterations to the retort-house, &c.

The amount required for payment of the year's maximum dividend is as follows: 10 per cent. on £20,000 original ordinary capital, £2000; 10 per cent. on £15,000 additional ordinary capital, £1500; 6 per cent. on £15,000 guaranteed capital, £900—total, £4400. Or, if the £15,000 additional capital is limited to a maximum dividend of 6 per cent., a reduction of £600 should be made; leaving £3800 as the total authorized dividend.

Reserve Fund.

The amount of the authorized reserve fund is £5000. This sum has been standing to the credit of the reserve fund for many years past, and on the 31st of May, 1900, appears, according to the Company's books, to be then invested

as follows: Devonport Corporation, £1700; Victoria 3½ per cent. bond (£500), £506 18s. 6d.; Queensland 3½ per cent. bond (£1000), and Victoria 4 per cent. bond (£600), £1730; on deposit with the Devon and Cornwall Bank, £1100—total, £5036 18s. 6d.

Price of Gas.

The price charged to private consumers per 1000 cubic feet during the past ten years was as follows: Year ending 31st of May, 1891, 2s. 6d., 2s. 4d.; 1892, 1893, and 1894, 2s. 9d., 2s. 6d., 2s. 4d.; 1895, 2s. 9d., 2s. 8d., 2s. 6d.; 1896, 2s. 8d., 2s. 7d., 2s. 6d., 2s. 4d.; 1897, 1898, 1899, 1900, 2s. 6d. and 2s. 4d.

Sale of Gas.

The approximate quantity of gas sold during the past ten years was as follows:—

Year ending May 31.	Private Lighting.	Public Lighting.	Total.
1891	133,632,600	11,686,000	145,318,600
1892	139,913,400	12,689,000	152,602,400
1893	140,282,200	12,941,000	153,223,200
1894	143,660,100	13,428,000	157,088,100
1895	152,326,000	13,921,000	166,247,000
1896	156,412,000	14,289,000	170,701,000
1897	168,635,100	14,646,000	183,281,100
1898	171,243,100	14,999,000	186,242,100
1899	192,933,700	15,454,000	208,387,700
1900	201,519,600	15,836,000	217,355,600

Balance-Sheet.

We wish to place on record that we have not examined or verified the whole of the detailed items of which our amended balance-sheet of the Company on the 31st of May, 1900, is composed. We mention this as the item of £6498 5s. 8d. shown to be due on gas and meter rental account, less deposits and prepayments, is overstated according to the detailed lists prepared at our request, by a sum of approximately £500. This shortage also existed on the 31st of May, 1899, and possibly is an accumulation of errors for many years past. From the system upon which the Company's books have been kept, it would require many months' labour to now ascertain when the shortage on rental account first arose; but we are satisfied that the £500 difference on the 31st of May, 1900, arose prior to the 31st of May, 1899, and, in consequence, the rental account, so far as the year ending the 31st of May, 1900, was not affected thereby.

We may here state that the amount of time occupied by us in our examination has been greatly in excess of what it should have been had the books been correctly kept on a proper and simple system. The principle upon which they have been kept from the commencement of the Company has been intricate and complicated, and one lending itself to confusion and errors, with no adequate check upon the due collection of money owing to the Company.

Mr. BODILLY said that, in regard to certain matters in the report, the Accountants were unable definitely to advise the Court whether the amounts were properly included in the revenue or capital expenditure; and in regard to these, he should desire to call evidence. With reference to the capital account, he submitted that the real construction of the clause of the Act authorizing the issue of additional shares on which they had been paying 10 per cent., was that they were only entitled to pay 6 per cent. Then there was the point as to the paying of income-tax upon the dividends paid by the Company.

The RECORDER said all this was summed up very well in the report. What it came to was this, that if the dividend was at the rate of 10 per cent., the shareholders had not at present received all that they were entitled to; while if it was 6 per cent., they had been overpaid.

Mr. BODILLY contended that the shareholders had really been paid the amount of the dividends to which they were entitled, and more; and there should be a balance standing in the books of the Company a sum of £15,852 1s. 3d. The total expenditure on capital account, as shown by the accounts of the Company to May 31, 1900, was £65,804; but the Accountants increased this by £723, which represented expenditure chargeable to capital but really charged to revenue. There were other matters which they were unable to trace, and that was particularly the case with regard to the new boilers purchased in 1900, as to which they said they were unable to ascertain the cost of the old boilers, so as to arrive at the proportion of the cost chargeable to revenue and to capital account. In another part of the report, it was stated that the Accountants were informed by an official of the Company that the boilers were not in use until after May 31, 1900. If that was so, the Company had included a sum of £1151 for these boilers, no portion of which was entitled to be placed to the revenue account of that year at all. If the new boilers had come into use then, the proportion of the cost which fairly represented the difference between the cost of the old boilers and the new ones might have been placed to revenue account; but if the old boilers were still in use, no portion of the cost of the new boilers should have been placed to revenue account. With reference to the question of the retorts, the evidence on the last occasion was that there was a very large number of new retorts; but the Accountants, it appeared, were unable to identify those which were new. Then as to the question of the freehold of the land, £4250 was expended from the revenue of the Company which should have been charged to capital account. Although this sum had been spent prior to the year 1900, still they were entitled to inquire into it for the purpose of showing the exact amount of the reduction, because the amount which should have been standing to the credit of the Company should have included the £4250 which was paid out of revenue. There was no authority by which the Company were entitled to write off sums for depreciation; and he therefore claimed that the £6000 which was reported by the Accountants to have been written off, should also be taken into account as part of the balance which the Company ought to have had in hand. These items made a total of £10,250, which should be added to the balance of profit and loss account, and would make a sum of £17,550 5s. 2d. available for dividend at the end of the year. In the item of repairs and maintenance of works, the amount expended by the Company in the year 1900 was enormously in excess of what they had been accustomed to expend in any other year. It might be said that the Court must look only to the year 1900 in order to ascertain what the profits were. This was wrong. The Court must base their finding upon that year; but they were entitled to look to other years, and see what the proper expenditure was. The exact figure which represented the profit the Accountants were unable to ascertain; and it was therefore left for the Court to arrive at what they considered to be a reasonable amount, having regard to the original cost of the plant which had been replaced by new apparatus. The report, he submitted, came to this—that the Company had improperly paid dividends to the extent of 4 per cent. per annum on part of their capital; that if this amount were taken into consideration, a very large sum should be lying in the coffers of the Company; that they had been spending sums out of revenue which ought to have been charged to capital; and that there might be, and probably were, other large sums which should stand to the credit of the Company. His contention was that, under these circumstances, there was no justification for the increase in the price of gas; and that, at any rate, a reduction to the extent of the 6d. per 1000 cubic feet which was put on last year should now be made.

Mr. BAGGALLAY said the petitioners could only ask the Court to deal with the accounts of last year. They were trying to get outside the report which they asked for.

The RECORDER understood the application was for a reduction of 6d. from the present price.

Mr. BODILLY: Yes.

Mr. *E. H. Stevenson* was then called by Mr. BODILLY, who asked a question as to the allocation of the cost of the new boilers.

Mr. BAGGALLAY objected to the question, and said that the report spoke for itself.

The RECORDER agreed that he could not have an explanation of the report. What he wanted was evidence of facts.

Mr. BODILLY said that if it was a question of fact whether there were new boilers, he should be obliged if the Court would call witnesses.

The RECORDER said he must not take part in ascertaining facts. He treated the report as a contentious document; and Mr. Bodilly must show him that the money was wrongly charged to revenue.

Mr. BODILLY (reading from the report): "With regard to subheading (A), we are informed that the two new boilers were a replacement of two of considerably smaller capacity."

The RECORDER: That is not evidence.

Mr. BODILLY suggested that he should be allowed to call one or other of the Accountants and ask what they were informed by an official of the Company.

Mr. BAGGALLAY objected to this course being taken. These two gentlemen were appointed as officers of the Court to ascertain the actual state and condition of the concerns of the Company. They had done this, and presented a report. If the Court thought there was anything ambiguous in the report, they might be called and examined; but to go beyond the report, and ask for further information, would be quite wrong. The case was in the nature of a hostile action against the Company; and the onus was entirely on the other side to make out their case. In framing their report, the Accountants said there were two contingencies to be considered before they could make out how much of the cost was chargeable to revenue and how much to capital. One was the question of the capacity of the boilers, and the other was that of the cost. The cost was the real guide, not the capacity; and they said they had no means of ascertaining the cost of the original boilers. Unless they could have this to compare with the cost of the new boilers, the Court could not allocate the cost. The only gentleman who could have given them assistance in the matter had been dead for a long time.

Mr. BODILLY: Are the books dead, too?

Mr. BAGGALLAY: You have had the books. What I object to is Mr. Stevenson coming here as an expert to tell us what is the meaning of the report.

The RECORDER: What do you say as to the Accountants being competent witnesses?

Mr. BODILLY: If the account is ambiguous, you can call them. I do not desire to put them in the box as my witnesses.

The RECORDER: I have no doubt, as a point of fact, that two new boilers were supplied; but what does not appear upon the report is what the relative cost of the new boilers was as compared with the cost of the old ones.

Mr. BODILLY: I could not prove that.

The RECORDER: If you cannot prove it, it is very difficult for me to come at any figure. Before I can make an order under this section, I must see what material I have got. The only order in the books, so far as I know, was upset. I could refer it back, if I thought the Accountants had not completed it; but reading the report carefully, I have come to the conclusion they have done all they could.

Mr. BODILLY: It is a little remarkable that in the books of the Company there should be no record of the cost of the original boilers.

The RECORDER said his impression was that the Accountants were not competent witnesses. They could not be cross-examined any more than a Registrar or a Master in Chancery. He was also of opinion that there was no evidence which enabled him to say that the cost of the boilers was capital expenditure.

Witness was then asked by Mr. BODILLY if the working expenses of the Company were not abnormally high; and he said they were so last year. In the previous nine years, the average expenditure upon repairs and maintenance of works and mains and services, was 3·29d. per 1000 cubic feet of gas sold. In 1900, it was 8·29d. This was an increase of nearly 5d. per 1000 cubic feet, and represented an additional expenditure last year of £4500

Mr. BODILLY: What was the effect of this upon the cost of gas?

Witness: The cost is enhanced by 5d. per 1000 cubic feet.

And what would be the effect upon the following year?—The following year the expenditure would be below the normal.

By Mr. BAGGALLAY: The normal expenditure on repairs and maintenance in works of this sort was generally about 4½d. per 1000 cubic feet of gas sold. This was the ideal expenditure; but in reality less was generally spent. The practice varied. He should not say that 3·29d. was abnormally low; but it was below the ideal. In the last twenty years, the expenditure at Plymouth on the same items had averaged 2·6d., and there were no special reasons to account for that.

Mr. BAGGALLAY: Is your suggestion that the 8·27d. is wholly for items which ought to have been included in the 4½d. which is the ideal expenditure, or is it abnormally high because charges have been made to revenue which ought to have gone to capital?

Witness: There is no doubt that many of the charges should have gone to capital.

If it is a fact that the cost of the two new boilers is lower than that

of the original ones, this would have to be taken out?—Not unless the boilers were brought into action in the year of account. It would be a proper revenue charge when the apparatus is brought into action.

Suppose, on the other hand, the whole of this £1151 for the boilers were chargeable to capital, and you added that amount to the balance of profit, there would still not be sufficient to pay the authorized dividends?—Yes; there would, if the cost of the setting were treated in the same way.

In further cross-examination, witness said he had had experience of many maximum dividend companies. Some never attempted to pay up back-dividends; others did not begin it for many years. It had been a common practice for companies to pay income-tax on dividends; but within the last two or three years, owing to what took place in the Morley arbitration and the Ossett case, they were abandoning it. As a matter of accountancy, it was the practice to treat the payment of income-tax as payment of back-dividends.

The RECORDER: That is in arbitrations to ascertain the value of works. Do you say it affects the question here?

Mr. BAGGALLAY: It will not affect it very materially, because there is still a claim for back-dividends, which is not satisfied by saying that there is overpayment of dividends on other shares.

Mr. BODILLY: As to that, I say they are entitled to distribute so much per cent. upon their capital. If they distribute too much to one and too little to another, they could not afterwards say they were entitled to back-dividends.

The RECORDER: Suppose they had subscribed £5000 to a charitable institution, would not that be very much the same thing as making some of the shareholders a present of 4 per cent?

Mr. BODILLY: No; because here they have paid the shareholders dividends to the prescribed amount.

The RECORDER: Do you say that a holder of original stock in the Company who did not get dividends in the first years has had his full dividends by reason that some other shareholder has had more?

Mr. BODILLY: No; I do not say that. But I say the Company have paid their full dividends. If the amount is sufficient to pay the dividend, it fulfils the section of the Act of Parliament. Moreover, they are estopped from setting up any such plea now, as they are not entitled to make a reserve fund until the back-dividends are paid.

Mr. BAGGALLAY: In section 35 of the Gas-Works Clauses Act, the condition prescribed is "that dividends to the amount hereinbefore limited have been paid." It is not a question of the dividends having been earned; they must be paid.

Mr. BODILLY remarked that they had been paid, according to his argument. Continuing, he said he proposed to take as a basis the sum of £2552, which the Accountants gave as the net profit of the year. He would add to this £1551 the cost of the two new boilers and the setting, on the ground that the boilers did not come into use in 1900, and none of the cost ought to be brought into the revenue account of that year. The Accountants were of opinion that there was some proportion of the cost of alterations to the retort-house which was chargeable to capital; but he could not show what it was.

The RECORDER: If it is capable of being shown, it must be shown.

Mr. BODILLY: I cannot carry it any further. Then there was interest on the bank overdraft, £183. The Company had no authority to incur liability in respect to an overdraft for any purpose; and any payment in respect of interest or such overdraft was illegal. Besides this, there was the additional 4 per cent. on £15,000 of the capital which was only entitled to 6 per cent., which amounted to £600.

Mr. BAGGALLAY remarked that if this item was included, it must be deducted from the sum necessary to pay the dividend. It was accordingly omitted.

Mr. BODILLY said that in the general balance-sheet prepared by the Accountants, there was the following entry as regards the stock: "By coals, £1279; coke and breeze, not known; tar and other products, not known."

The RECORDER said no evidence had been given that there was any stock.

Mr. BODILLY: It is a matter of common knowledge that every company possess a stock of coal.

The RECORDER: I cannot take that.

Mr. BAGGALLAY remarked that there was no credit for stock at the beginning of the year; so that the one would balance the other.

Mr. BODILLY said the sums he had mentioned—£2552 the net profit found by the Accountants, £183 interest on overdraft, and £1550 the cost of the boilers—came to £4285; and as the sum required to pay the dividends was £3800, there was a balance of £485. A penny per 1000 cubic feet produced £900; and he asked for a reduction of 6½d. or 6d. below the present price.

The RECORDER: You say that 2s. 6d. per 1000 cubic feet is enough to pay the full dividend, and leave the Company with a balance of £485.

Mr. BODILLY: Yes

Mr. BAGGALLAY submitted that the Court could only take into consideration the accounts for the year ending May 31, 1900. It could not look forward beyond that year, because if it did, it had to take into consideration other circumstances—a rise in the price of coal, a fall in the price of residuals, and other things affecting the price of gas. It was a matter of common knowledge that, during the current year, all companies had increased the price of gas. The Court could, however, only deal with the year 1900, and take the price of 2s. 6d. per 1000 cubic feet at the end of the year. It was not proposed that the price should be reduced below 2s. 6d.

Mr. BODILLY: It can be reduced ½d. below 2s. 6d.

Mr. BAGGALLAY said it would be unusual to reduce the price by ½d. The basis of all sliding-scales was 1d.

The RECORDER: If I came to the conclusion that there should be a reduction, I should not order a fractional reduction.

Mr. BAGGALLAY said the Court was invited by the petitioners to look to the current year, and reduce the price from 3s.; and that was justified by taking out a figure from the accounts for 1900 and moving it forward into the current year. But if the whole of the cost of the new boilers was placed on the next year, it would be thrown on the year in respect of which the additional 6d. was charged.

Mr. BODILLY remarked that if he had gone into these things, he should have said that, before increasing the price of gas, the Company should have expended the money which they had, or ought to have had, in hand.

Mr. BAGGALLAY: Does my friend ask for a reduction of 6d. from the current price of 3s., or from the former price of 2s. 6d.?

Mr. BODILLY: I ask for a reduction of 6d. It is purely a matter for the Court to decide what the proper reduction should be. The Court is not bound by any statement of mine as to what the reduction should be. The figures show that.

Mr. BAGGALLAY: The Court is asked to make a reduction of something from something which is not defined. The maximum profit which Mr. Bodilly has made out was £4285, or £485 above the amount required to pay the dividends on the lower scale. So that, upon these figures, the price of gas could not be reduced more than ½d. per 1000 cubic feet.

Mr. BODILLY contended that the reduction must be a reduction of the present price of gas. It could not be a reduction of the past price or of the future price.

Mr. BAGGALLAY pointed out that, under section 35 of the Gas-Works Clauses Act, three conditions had to be fulfilled before the order could be made reducing the price of gas. In the first place, the profits of the undertakers for the preceding year must have exceeded the prescribed rate. The prescribed rate was defined by section 30 as being the maximum rate of dividend, *plus* any amount required to make up the deficiency of any previous dividends. Then section 31 provided that, when the dividend was made up, they had then to fill up the reserve fund. This condition was not fulfilled in this case at all. The profit last year fell short of the sum required for the dividend by nearly £1300. Besides this, there was a claim for back-dividends of £9000, after deducting the amount of income-tax which had been paid. Therefore, under section 35, it was impossible to make the order; and the order, if made, would be bad. There might be a sentimental argument on the other side, that the Company had been overpaying certain sums to certain shareholders. He did not admit that he agreed with that. But supposing they did pay the money, and it was wrong, this would not be a reason for doing an injury to other shareholders. If there was wrong done, it was an extraordinary thing it was never found out. The Company had been in existence a long time; and what was done was known to the townspeople. He daresay they would find that members of the Corporation were shareholders. If a wrong was done, the remedy was an injunction in the Civil Courts; and if the accounts were not published, the Local Authority were as much to blame as the Company, in not asking for them. It must have been known throughout Devonport that, within ten weeks of the passing of the Act of 1853, the shares were issued at 10 per cent.; and the Town Clerk then happened to be the Solicitor to the Company. It did not matter, for the purpose of the Recorder's decision, whether these shares should have been issued at 6 or 10 per cent.; but he was assuming, for the purpose of these figures, that they ought to have been issued at 6 per cent. He was sure the Court would not wish to prejudice the Company before Parliament, or in the arbitration that might hereafter take place, by a decision on the point.

The RECORDER thought it would not be necessary to refer to it.

Mr. BAGGALLAY understood that it was necessary for the Court to make some observations upon the point on the last occasion, in the nature of instructions to the Accountants. Then there was the question of the application of revenue to capital purposes. It seemed to be looked upon with horror by gas experts that revenue should be applied to capital purposes. They absolutely forgot that this was the policy of the Legislature in regard to such undertakings as this at the time of the passing of the Company's Act of 1845, that sums should be set aside out of the profits for enlarging and improving the works. He did not want to labour the point, because he knew that gas companies did not often act upon this condition, but as near as they could they charged to the respective accounts the things chargeable to revenue and capital. In principle, however, it was not wrong.

The RECORDER: How do you deal with the suggestion that the £1552 ought not to be paid out of revenue until the plant was brought into use?

Mr. BAGGALLAY: No liability had been incurred; and I do not see why you should not pay for the thing, and bring it into the account from the time you have paid for it. This was better than putting it to capital account for one year, and then transferring it to revenue. The effect of this would be that for the one year four boilers would be charged to capital. A far more simple and natural plan was to charge the amount to revenue at once. The Auditors pointed out that the Company were entitled to provide a fund for the depreciation of their leaseholds.

Mr. BODILLY said the Company had no leasehold property now.

Mr. BAGGALLAY: There was a great deal of discussion on the question of the leaseholds last time.

The RECORDER said he did not intend to deal with that, because it was not one of the items on which the claim to reduction was made.

Mr. BAGGALLAY submitted that the Court had no power, under the circumstances, to order a reduction of the price. The onus of proof was on the petitioners; and they had failed to show any cause for a reduction.

Mr. BODILLY urged that the only onus upon him was fulfilled at the last sessions, when he brought forward the accounts of the Company, and showed that they required to be looked into. Mr. Baggallay had narrowed down section 35 to an unreasonable degree. The Accountants were to examine into the actual state and condition of the concerns of the undertakers, and were not limited in their report as to the profits for the year ended May 31, 1900. It was perfectly clear that the Company had been paying an excess dividend of 4 per cent. per annum upon £15,000; and that they had formed a depreciation fund which they had no right to form, and had paid sums out of revenue that they were not entitled to pay. On May 31, 1900, they ought to have had in hand a very large sum indeed. Mr. Baggallay contended that they were not entitled to go into any of these questions, because the Company had not paid the dividend of the prescribed rate, inasmuch as in 1871 there was some left unpaid. His answer to this was that the prescribed rate of dividend was a certain annual sum, and that from the report of the Accountants it was clear that the prescribed rate had been overpaid to the extent of £25,000. It did not matter to the petitioners whether one

class of shareholders had received it or another. That the prescribed dividend had been paid was shown by the fact that they had formed a reserve fund, which they could not begin to form until back-dividends were paid.

The RECORDER repeated his observation at the last sessions, when the application for the appointment of an Accountant was made, that proceedings under section 35 of the Gas-Works Clauses Act were very unusual, and the clause was very difficult to put into operation. It was not necessary to recapitulate the grounds upon which he made the order. A sufficient justification of it was contained in the report which the Accountants had made. The report showed that, since 1871, full dividends had been paid upon the capital, which was a very moderate amount for an undertaking of the kind which the Company carried on. He had ground for assuming that the highest rate of dividend which could be paid upon the shares issued under the Company's Act of 1853 was 6 per cent. It was not necessary that he should affirm or disaffirm the opinion he then expressed; but if he was right in the view he took, £25,000 had been distributed among certain shareholders which might have been available, if the peculiar machinery of this section had been brought into use before, for the reduction of the price of gas. This seemed a very substantial warrant for the inquiry. But the view he took was that the £25,000 must pass out of the case. If he had been drafting the clause, he thought he could have framed one a little more in the interest of the consumers than this was; but he had to deal with the clause as he found it. The report showed that, in the year which was under inquiry, there was an expenditure very largely in excess of the ordinary amount for repairs and maintenance of works—a sum which would account very nearly for a 6d. gas-rate; and Mr. Bodilly naturally looked to this figure of £4500, and was very anxious to plead that in aid of his application, because too high a profit was distributed in 1900. If he (the Recorder) were at liberty to surmise whether any part of this amount might be distributed between capital and revenue, he could do so. But he was not there to surmise. He had to decide the application on the facts before him. Some other things appeared from the report. It appeared that the freehold of the premises was paid for out of revenue. It was fairly to be said, on the other hand, that there might have been a sinking fund to meet the depreciation of the leaseholds; and it might be that there was practical compensation between the sum paid for the freehold and the sum which was not provided for the depreciation of the leaseholds. If the accounts had been kept as they ought to have been, there would have been no difficulty on this subject. There were other things—like the payment of income-tax—which he dealt with as mistakes. He could not doubt that it was a proper course for the applicants to demand that this inquiry should take place, and that it would serve a useful purpose. They were, however, there, not to justify the inquiry, but to determine as to the issue of an order by the Court to make a rateable reduction in the price charged for gas. Probably a "cadi" would order some reduction; but he sat there as Recorder, and he was very much impressed with what happened some years ago when a Recorder dealt with a case in what might be called a spirit of natural justice. The order was quashed, and the people who obtained it were put to great expense. He could not take the view that no burden of proof rested upon the applicants. He did not know of any proceeding where a Court voluntarily acted on a motion to make an order adverse to any party that was before the Court. The first matter to be ascertained was whether, in the year ending May 31, 1900, the profits of the undertaking exceeded the rate prescribed by section 30 of the Act. The Accountants said that the sum of £2552 17s. 7d. was "the net profit of the Company for the year, subject to the addition thereto of a proportion (if any) of the cost of new boilers and alterations to retort-house, &c." If the item of £1551 for the new boilers and setting was properly added to the £2552, there would be a sum in excess of the amount necessary to pay the maximum dividends. He did not think the £183 material; and he did not decide anything as to that. If Mr. Bodilly was right with regard to the £1551, he was entitled to a reduction in the price of gas. But to what reduction? He had got a balance of £485; and he was asked, in respect to this balance, to reduce the price of gas by 6¾d. per 1000 cubic feet. The argument that expenditure became revenue expenditure in the year when the apparatus came into use, but was not revenue expenditure in the year under consideration, was ingenious—almost captivating; but to his mind, if expenditure was revenue expenditure at any time, it was revenue expenditure when it came to be paid. According to the other view, it would be revenue expenditure in 1901. What, then, would be the right charge for gas which would give the undertakers their profit? So that if this £1551 came into the account, it must be brought in before any order was made for the reduction of the price of gas. That finding with reference to the item of £1551 disposed of the application. He therefore made no order with regard to the reduction of the price of gas. He assumed that the state of things was to go on; that the report would be in the records of the Court, and the keener interest taken in the affairs of the Company would continue; and that the gas consumers would want to know some time or other whether the £25,000 which had been overpaid was not to result in some way to their benefit. The application for the appointment of the Accountants was justified; but the order for a reduction in the price of gas must fail.

Mr. BAGGALLAY: Now that you have given your decision, I may tell you that the Board do intend, as a matter of fact, having regard to the alteration in the price of coal, to revert to the old price of 2s. 6d. on June 1 next.

Mr. BODILLY: I think that is quite prudent.

Imprisonment for Stealing from an Automatic Meter.

At the Middlesex Sessions last Saturday, before Mr. Loveland-Loveland, K.C., George Brown, 32, plasterer, was indicted for stealing 2s. 11d., the money of the Brentford Gas Company. The evidence showed that on the 26th of September last the tenants of No. 3, Elmfield Road, Southall, removed, and asked the occupant of the next house, also a George Brown, but not related to the prisoner, to "give an eye" to the premises. At 10 p.m. on the 27th, Mrs. Brown heard sounds from the vacated house, went to the front, and saw prisoner kneeling down by the automatic meter in the front parlour. She informed her husband, who went to the rear of the premises and saw his namesake leave by a window. He summoned the police and the meter was found damaged and robbed. According to the Company's witnesses, there should have been 2s. 11d. in the box. Prisoner left his home at Southall for about six months, and on his return was arrested. The defence was an *alibi*; but the Jury found prisoner guilty. Mr. Leycester, Counsel for the prosecution, said gas companies had suffered considerably by their automatic meters being broken open. They did not mind the loss of the money so much as the damage done. The offenders were very hard to catch; and it was only by a piece of good fortune that prisoner was arrested. Mr. Loveland-Loveland said the offence was a serious one, and the accused would have to go to prison for six months, with hard labour.

Robbing the Sheffield Gas Company.

At the Sheffield Police Court last Wednesday, James Johnson, of Attercliffe Common, was summoned by the Sheffield Gas Company for stealing a quantity of gas between March 8 and 28. The evidence showed that in June last, in consequence of the defendant being in arrear with his payments, the meter was removed from his premises. A short time ago, it was discovered that gas was being burnt in his shop; and on March 28 two burners were found lighted there. A tube had been fixed to the service-pipe. Johnson pleaded guilty. He said he was too poor to pay for the gas, and was tempted to steal it. He was fined £1, including costs; this being his first offence.

Use of Domestic Water for Trade Purposes.

Before the Thornbury Magistrates a few days ago, George Witts and Frederick Holly, master and servant, of Thornbury, were summoned for using in an unlawful manner the water supplied by the West Gloucestershire Water Company for domestic purposes. Mr. Addison, who prosecuted, explained that the offence was committed in July of last year, and the case was first heard last August, when the Bench dismissed it with costs. (See "JOURNAL" for Aug. 7, 1900, p. 360.) Leave to state a case was granted; and the matter came before the Judges in the King's Bench Division of the High Court of Justice, when the decision of the Thornbury Magistrates was reversed, as it was found that Mr. Witts had used for trade purposes quantities of water, contrary to the provisions of the Water-Works Clauses Act, 1863. (See *ante*, p. 404.) Mr. Addison proceeded to address the Bench principally on the question of costs. On the previous occasion, when the case was dismissed, the Company had to pay the defendants' costs. Now, as it had been reversed, and the Bench had been ordered to convict, it was only just that they should be repaid. They were not entitled to any costs on the appeal; and as the misuse of the water had continued, he asked for substantial costs on that case. Mr. Witt denied that he or his servant had used one spoonful of the water for trade purposes. The Bench said they must convict; and they fined Witts 10s. and costs, and Holly 2s. 6d. They allowed the costs asked for, which it was understood would amount to about £10.

Leaving Work without Notice.

At the Sandwich Petty Sessions, a few days ago, Walter Pearson, a stoker, was summoned for breaking his contract with the Gas Department on the 8th of March. From the evidence given by Mr. Samuel A. Carpenter, the Manager, defendant was on weekly wages of 27s. (seven days), and he left work on the above date without giving a week's notice. Pearson should have changed from day to night work, and there was consequently no stoker available for Saturday morning or Saturday night. Defendant, who was asked to attend before the Gas Committee, but failed to do so, pleaded that there was no agreement whatever, and other men had left without notice. The Magistrates fined him 27s., the amount of one week's wages (costs being remitted), or fourteen days' hard labour; remarking that his neglect of duty might have led to serious trouble and annoyance.

Thefts from Slot Meters.

The Corporation of Stoke-on-Trent have been obliged to issue a special circular to consumers of gas under the slot-meter system, owing to the frequency of thefts from these meters. Tenants are requested now to give notice of their intention to leave their houses, because youthful thieves visit empty houses and lock-up offices with a view of robbing the meters. On Monday last week, at the local Police Court, two youths, named Alfred Nabney and Harry Bartlam, were charged with breaking into the office of Mr. W. A. Lindop, coal dealer, and stealing 1s. 8d. from a slot meter. On Friday, Mr. Lindop found that the meter had been broken open, and the box, with the money in, taken out. Nabney and Bartlam were afterwards seen together regaling one another at a confectioner's shop, and were arrested by a detective, who suspected that they had been in mischief, as they had offended before. Nabney confessed, and implicated Bartlam, who pleaded his innocence. The former was ordered to undergo two months' imprisonment, with hard labour, and the latter was acquitted.

Theft of Gas by a Hull Tradesman.

At the Hull City Police Court a few days ago, John Wilkinson, a plumber, of High Street, was summoned for laying a pipe to connect with another belonging to the Corporation, and taking gas for his use without their consent. The defendant had a penny-in-the-slot meter, which he had disconnected, and had obtained, by the usual means of an india-rubber pipe, a supply of gas without its being registered. Defendant said that besides the gas he had two paraffin lamps, but had forgotten to get in a supply of oil; and as he had no coppers and no light, he was forced to take the action he did. He had no fraudulent intention, and had only used the gas one night. The Bench considered the case a very bad one; and a fine of £5, including costs, was imposed, with an alternative of 30 days' imprisonment.

MISCELLANEOUS NEWS.

PURCHASE OF THE HEMEL HEMPSTED WATER-WORKS.

A Sketch of the Arbitration Proceedings.

The Hemel Hempsted Water-Works are about to pass over to the Corporation; and the arbitration proceedings to determine the value of the property have taken place—the discussion of the matter before the Umpire (Mr. James Mansergh) and the Arbitrators (Messrs. W. Eve and C. Hawksley) occupying no less than three days at Westminster. The Counsel who conducted the Company's case were Mr. Freeman, K.C., and Mr. E. Morten; and Mr. Claude Baggallay, K.C., and Mr. Mackenzie looked after the interests of the Corporation. The witnesses called numbered a round dozen.

The Hemel Hempsted Water-Works were constructed in 1866; a Provisional Order was obtained by the Company thirty years later; and the Act authorizing the present transfer was passed last year. The preamble of the Act recites the facts material to the history of the Company. The capital, it states, consists of £12,100 ordinary stock, entitled to a maximum dividend of 10 per cent. per annum; £3000 ordinary stock, entitled to a maximum dividend of 7 per cent.; and the Company have borrowed on mortgage or debentures £2500. It then sets forth the powers obtained by the Company under the Provisional Order over a specified area of supply, and proceeds to show that provision was made in the Order for the purchase, in the usual way, of the undertaking by the Corporation—the Act itself being the result. The duties of the Arbitrators are simply defined. They are to find the total value of the undertaking, then deduct the £2500 mortgage debt from it, which debt is to be taken over by the Corporation, and is to form a first charge on the undertaking, subject to the previous payment of the working expenses. To the foregoing matters Mr. Freeman called attention in his opening; and then he presented some detailed particulars as to the position of the Company. At the pumping-station, there is a well 150 feet deep and 12 inches in diameter, with the tube sunk to 60 feet. This is in the chalk; and the yield of water is abundantly sufficient for all demands. The normal water-level in the well when pumping is not in progress is about 6 ft. 6 in. from the surface; and when the pumps are drawing 30,000 gallons an hour, it falls to about 12 feet. There are two boilers; and the machinery comprises a condensing engine capable of raising 18,000 gallons an hour, a Worthington engine capable of raising 20,000 gallons an hour, and a triple-expansion surface condensing engine capable of raising 30,000 gallons an hour. Therefore the works are particularly well equipped with pumping plant. There are two pumping-mains and three reservoirs, of a capacity respectively of 85,000 gallons, 150,000 gallons, and 27,000 gallons. The maximum quantity of water pumped in a week is 1,828,000 gallons, which is equal to 261,000 gallons a day; and the minimum quantity 1,057,700 gallons a week, which is equivalent to 157,110 gallons a day. The population of the district is 11,000; and the estimated population supplied is 8700. Therefore, taking the amount of water pumped in 1899—77,900,000 gallons—this would give for the population actually served 24·5 gallons per head. The length of the mains is 20½ miles; and a large part was relaid after the severe frost of 1895. Their cover is now from 2 ft. 6 in. to 2 ft. 9 in.; and, according to Mr. Freeman, since the pipes were relaid they have never been frozen. The mains are nearly all in chalk, and the water is slightly hard; the result being that they are preserved in the most excellent condition. As to the financial results of the Company's trading, for the first six years (from 1867) no dividend was paid; but by 1896 it had reached 6½ per cent.; in 1897 it was 7 per cent.; and since then the maximum dividends of 10 and 7 per cent. have been paid. Then Mr. Freeman claimed that the total amount of back-dividends to which the Company are entitled is £786 10s. He also called attention to the fact that the Company have secured a contract to supply the Apsley Mills, which are a few yards outside their limits. But owing to this question of purchase arising, the County Council thought it better to reserve their permission to the laying of the few yards of main. An unusual factor to be taken into consideration in this case is that connected with the pumping-station, and a part of the Company's business, are twelve baths, which, however, up to the present have not been very remunerative. In dealing with the question of the valuation of the concern, Mr. Freeman stated that his witnesses had endeavoured to arrive at what was the value of the undertaking if it were in an absolutely perfect condition; and then from this the witnesses had made deductions by arriving at what the actual cost of the things required would be, and then they took a percentage upon that. Starting with the assumption that the concern is absolutely perfect, they placed the worth at 36·36 years' purchase; and the profit in 1899 being £1456 2s. 6d. (as shown by tables prepared by Messrs. Lass, Wood, and Drew), gave a total value of £52,944 3s. Then the deductions necessary to arrive at the true value of the undertaking were: Additional expenditure for maintenance £190, multiplied by the 36·36 years, equalled £6908 8s., and the cost of mains needing renewal at the present time would be £312 15s.—together £7221 3s. Deducting this from the £52,944 gave £45,723, which would be equal to 31·4 years' purchase of the profits for the year 1899. Then additions made for prospective value were these: Present value for difference between net corrected profit and maximum dividend £5396, and the present value of arrears of dividend £826—making, with the £45,723, £51,945. To this a further 1½ per cent. was added for cost of, and delay in, reinvestment (£778), making £52,723, from which had to be deducted the mortgage bonds and loan £2500—making £50,223. This sum equalled 34·5 years' purchase of the profit for 1899, or 35·3 years' purchase of the maximum dividends. For the baths, the Company simply asked the value of the buildings at the present time—viz., £1300.

This is substantially the case laid before the Umpire and the Arbitrators by Mr. Freeman; but, in order to make the scheme of valuation perfectly intelligible, the figures given are taken from Mr. Henry Rofe's table rather than from the learned Counsel's paraphrase of its items. Mr. Rofe was the first witness, and he further explained, and gave the grounds on which he had placed, his valuation. Among new points, he showed that the mean working expenses for 1896-99 were about 39 per cent. of the gross income; that the cost of the mains and services was £8212; that the cost of the buildings and reservoirs was £3765; and that the cost of the pumps and machinery was £3786. Questions were put to witness in cross-examination to see whether he had taken into consideration such points of pure assumption as the future stability of the industry of the town and the population, and then matters of detail were inquired into. Counsel sought to make a point of the fact that the interest of £90 on loan capital (which is to be taken over by the Corporation) was included in the profit of £1456, which formed the commencing figure of the valuation; but the question as to whether it should be deducted or not was not satisfactorily cleared up at this or any other stage of the inquiry.

Following this witness came Mr. Arthur F. Phillips, who has been the Consulting Engineer of the Company for many years past; and it was under his direction that the present boilers and pumping plant were put down. He confirmed the figures given by Mr. Freeman as to the worth and the supply; and other parts of his evidence showed that the yield of water had always been abundant at any rate of pumping up to 30,000 gallons per hour. Running one engine as fast as possible, had never exhausted the supply; and special tests made when the water was low, had never resulted in the water going down below 12 ft. 6 in. He testified to the boilers being in good condition, and stated that either one of the three engines was capable of supplying the district. The mains running to the reservoirs were 8 and 6 inch. The number of houses supplied was 2250. (The actual quantity of water distributed and the population have already been given.)

Mr. Phillips's evidence was interrupted at this point in order that Mr. W. B. Bryan might be examined. A suggestion had been made that surface water might get into the well; but Mr. Bryan failed to see how this could happen, inasmuch as the well was tubed 60 feet below the surface, besides which the analyses taken for many years past showed that the water was perfectly pure. He described the surplus machine power as unusual, and stated that the supply of water was ample for a very great increase in the population. Taken through the figures in his valuation, the total, after deducting the mortgage bonds and loan, came out to £49,805, which is very close to Mr. Rofe's. On the point raised as to the £90 required as interest on the borrowed money being included in the net profits and multiplied by the 36·36 years, he stated that, in dealing with the value of an undertaking on the basis of actual profits, and so many years' purchase, the question of whether the profits, or part of them, were paid as interest on capital or on borrowed money had nothing to do with the matter. Mr. Bryan's opinion as to the improbability of the contamination of the water in the well was not shaken in cross-examination. He was interrogated at some length on the subjects of the engines and reservoirs (which are covered), but nothing was elicited to contradict previous statements. As to the distributing system, there was, he mentioned, a margin in the mains, excepting in part of the 2-inch ones. The Company have no reserve fund; and Mr. Baggallay beat about the point at great length. But witness declared that he knew very few water companies who did provide a reserve fund. On the number of years' purchase, witness was emphatic that he did not know of a single instance of a town like Hemel Hempsted that had gone back. He did not regard the multiplier as a large one; one of the elements to be considered being the steady progress of the concern itself.

Then Mr. Phillips was recalled to complete his testimony. He first informed the Arbitrators that the service was a constant one; and then he gave the total length of mains as 20½ miles—ranging from 8-inch to 2-inch. Up to Dec. 31, the capital expenditure was £18,595 18s. 7d.; and witness gave the details. He took 33⅓ years as his multiplier; and 10 per cent. for compulsory purchase. His adjustments, and adding £1300 for the baths and buildings, made a total of £53,836, from which the £2500 for mortgages and loans had to be deducted—leaving the valuation at £51,336. His cross-examination went into deeper detail; and it brought out the information that two new estates were about to be developed in the district. Following Mr. Phillips, Mr. Samuel Wood (of Messrs. Lass, Wood, and Drew) was called to throw light upon certain items in the tables which had been prepared for the purposes of the arbitration. That the Company's water was "clear and bright" and of "most excellent quality for dietetic and domestic purposes," was disclosed by a report put in by Mr. Arthur E. Ekins, F.C.S., &c. Mr. F. W. Kinnair Todd (architect) submitted his valuation of the baths at £1300.

In his opening for the Corporation, Mr. Baggallay soon made it clear that he did not think anything in excess of 30 years' purchase ought to be allowed; and in mentioning this figure, he assumed that the works were in such a condition that they would maintain the net profit available for dividend in 1899. Alderman C. E. Gray, a local draper, was first examined; but as to the prospects of Hemel Hempsted, his evidence did not diverge from that of the claimants. His only complaint appeared to be in reference to the Company's charges. According to the next witness—Mr. W. A. Fisher, an architect and surveyor, and a member of the Corporation—the town was only developing in the direction of small houses. However, he himself has invested in land for building purposes in the neighbourhood. But, in his cross-examination, he confessed that, from the water undertaking, the Corporation hoped to make profits to assist them in levelling the rates. Upon this he had no alternative but to say that they were prepared to pay a full and proper value for the concern. The engineering witness first called to uphold the contentions of the Corporation was Mr. G. F. Deacon. His view was that, assuming a standard of the highest class in water-works, 33⅓ years' purchase of the net maintainable income might be given; but for so small a concern as this, he adopted 30 years. (For the sake of lucidity we will take his figures direct from his valuation rather than from his evidence.) He took the net profit for 1889 from Messrs. Lass, Wood, and Drew's tables—viz., £1456 2s. 2d., from which he deducted temporary rent £4 17s. 6d.; leaving £1451 4s. 8d. Then he subjected this amount to the payment of the interest on the debenture loans £90—leaving £1361. He deducted next for a reserve fund 1 per cent. on the capital (necessary to maintain the present condition, if it was assumed that no further capital would be raised); and he thus adjusted the net revenue to £1174 16s. 2d. Multiplying this sum by

30 years' purchase, gave £35,244 5s. He proceeded to deduct £1525 for new buildings for engines and boilers only; £360 for transferring engines and boilers, including setting; £222 for a new borehole of the same depth and construction as the present one; £1694 for 1½ miles of 8-inch main from the new pumping-station to the existing 8-inch main; and £100 for land. Against these items he placed £400 for the sale of land and buildings, and then continued to make further deductions: £1400 for a new covered reservoir, and £3667 for substituting and lowering mains. Altogether the deductions totalled to £8568, which, taken from the £35,244, gave £26,676 5s. For prospective value—adopting the rate of increase of water-rental, and assuming that this would continue till the maximum dividend was reached in 1902, capitalizing the increase in each year, and discounting back to the year 1899—he gave £6899; making £33,575 5s. He then added for back-dividends £488, and five years' purchase of the profit on fittings, amounting to £161 5s. Thus he arrived at a valuation of £34,224 10s. In his computation, he assumed that the Corporation took over the loans, and that any cash balance was also transferred to them. On general points, he stated that he had satisfied himself that there was an easy passage for the surface water to the well; and that there was direct connection between the surface water and the water pumped. As his valuation showed, he also considered the amount of storage was inadequate for safety, and that certain of the mains required enlarging and lowering. In his cross-examination, he admitted that he had never had anything to do with the Company before, nor had he any special knowledge of Hemel Hempsted. In arriving at the profits of a company, he asserted that he invariably took off the interest on the debenture loans. In regard to the suggestion as to pollution, he confessed to not knowing that pumping had been going on for upwards of thirty years. He also went so far as to admit that the pollution was hypothetical; but it was a risk that might turn into a reality at any time. The deductions he had made in connection with the pumping plant and the well, he agreed, depended entirely upon whether he was right or wrong in proposing the removal of the well.

Evidence corroborating Mr. Deacon's was tendered by Mr. William Fox. He adopted a similar principle in his valuation, which worked out to £34,453 10s. The admission was extracted from him in cross-examination that he had never made a valuation before this one in connection with a water-works arbitration. Mr. W. R. Locke, the Borough Surveyor, put in a plan to show the depths of the mains in the district; and it was alleged by him that he had found a number of the smaller mains corroded.

The lengthy inquiry was concluded by the addresses of Counsel in support of their respective valuations. It was then arranged that the Umpire and the Arbitrators should visit Hemel Hempsted, accompanied by an expert from each side. But the friendly tone of the proceedings was not maintained to the end. It was pointed out, on behalf of the Corporation, that the Act provided for the transfer on an "appointed day;" and thereafter the Corporation were required to pay the Company interest at the rate of 4 per cent. per annum on the purchase money until completion, while the Corporation would be entitled to all receipts from the appointed day. It was therefore suggested that any dispute might be left to the determination of Mr. Wood; but Mr. Freeman could not be brought to agree to this. "Then," said Mr. Baggallay, "it may perhaps lead to litigation."

The Arbitrators' award has since been received by the parties—amounting to £44,189, including loans.

EDINBURGH AND LEITH GAS COMMISSION.

Cannel Coal Contracts.

A Meeting of the Edinburgh and Leith Gas Commission was held on Friday—Mr. PURVES in the chair.

The minutes of a meeting held on the 2nd inst., which were submitted and approved, showed the purchases of splint coal to be as follows:—

Name of Coal.	Edinburgh. Tons.	Leith. Tons.	Offerer.
Newcraighall splint	2,000	1,000	Niddrie and Benhar Coal Co.
Prestongrange chirls	3,000	3,000	Alex. Russell and Co.
Balbardie nuts	3,000	2,000	James M'Kelvie and Co.
Darngavil Heading nuts	2,000	1,000	Alex. Russell and Co.
Belhaven splint	3,000	3,000	Alexander Cameron.
Wallyford splint	3,000	2,000	James M'Kelvie and Co.
Birkiewood gas	1,000	1,000	,, ,,
Prestongrange splint	13,000	6,000	Alex. Russell and Co.
Darngavil Heading	6,000	4,000	,, ,,
Edmonstone splint	6,000	4,000	Niddrie and Benhar Coal Co.
Southrigg coking	2,000	1,000	Bow and Gilmour.
Newbattle Bottoms	13,000	7,000	Lothian Coal Co.
Southfield Heading	5,000	..	James M'Kelvie and Co.
Carmuir gas	6,000	2,000	James Miller, Son, and Co.
Balbardie gas	9,000	4,000	James M'Kelvie and Co.
Total	77,000	40,000	

The CHAIRMAN reported that the Works Committee had completed the purchase of cannel and oil for the year on very favourable terms. He was glad also to report that the increase in the quantity of gas made and sold for the period of the financial year from May 16 last was now 32 million cubic feet more than for the corresponding period of the past year. The total number of gas cooking-stoves had risen greatly. In Edinburgh the increase was 661; in Leith, 352; and in Portobello, 175—a total of 1188.

Bailie MANCLARK reported, for the Finance and Law Committee, that they had obtained a loan of £200,000 from the Corporation of Edinburgh, at 3¾ per cent. interest (already reported); and that they had renewed a loan of £150,000 from the Bank at ¾ per cent. less interest than before. This, he thought, was very satisfactory.

The Commissioners adopted the reports.

The price of gas at Wokingham has been reduced by 6d. per 1000 cubic feet from the 1st inst.

OLDBURY GAS DEPARTMENT.

The Past Year's Working.

Mr. A. Cooke, the General Manager of the Gas Department of the Oldbury District Council has just issued his report for the year ending Dec. 31. It shows that the total amount authorized to be borrowed is £79,199, all of which has been raised. The repayments to the end of the year totalled up to £16,358; leaving £62,841 to be paid off. The manufacture of gas cost £9654, against £7959 in the previous year. The increase in the price of coal is chiefly responsible for this, as in 1899 coal only cost £5992, whereas last year it came to £7147. Other fuel shows an increase of about £70; while tools, materials, and labour have increased from £353 to £746. There is a big drop, however, from £1160 to £347, in the repair and maintenance of mains and services; so that the distribution of gas cost, as a whole, £799, against £1562. The total expenditure is £12,079, compared with £11,063 before. Notwithstanding this, the gross profit is £€415, against £5313. The receipts for gas consumed, less discounts and allowances, amount to £12,676. The residual products are much better all round. They realized last year £5604, against £3812 in 1899—a difference of nearly £2000. The total receipts are £18,494, compared with £16,377. Of the first-named sum, £2237 will go for interest on mortgages, £737 for the repayment of loans, £600 has been transferred to the general district rate account, and there remains a net profit of £2900. The cost of the carburetted water-gas plant to date is £4629 18s. 6d. But as the Local Government Board will not sanction a loan for the amount, it will have to be paid for out of revenue; so that there will not be a very large sum to go to the relief of the rates this year.

At the Meeting of the District Council last Friday, the Gas Committee presented a report in which they stated that they had decided to hand £600 to the Council in relief of the rates. Mr. J. W. Wilson, M.P., moved the adoption of the report, and referred to the annual statement of accounts noticed above. He congratulated the Council upon having had the best year's trading ever experienced since the gas-works started. They had benefited very considerably, because the Committee had been in possession of a balance at the bank; for, seeing that the price of coal was rising, they purchased large quantities at a low price. They also benefited materially by the residuals sales; and, generally speaking, the Committee felt they had pursued a sound and conservative policy with regard to the gas undertaking. They considered it was heavily burdened in the old times, and they had adopted the practice of avoiding fresh loans. The last one was raised in 1885. They put down their regenerator plant out of income. Their rates were now £800, against £400 fifteen years ago. The distribution of gas had cost £1000 more than in 1899; but, on the other hand, they had received £400 more for gas, and about £1800 more for residuals, which gave an increased profit of £1200. With regard to the future, the Committee, as half promised twelve months ago, had been able to continue their contribution of £600 in relief of the rates; and they had made some modification in respect of the public lighting, which they hoped would result in more light being afforded at less cost to the ratepayers. Mr. S. Beach said he did not wish to oppose the handing over of the £600 in relief of the rates, but at the same time he must protest against the great injustice done to the consumers by this proceeding. He found that in one instance £50 would go to the reduction of the rates of one firm alone who did not pay a penny for gas; and he hoped this would at some future time lead to more consideration being paid to the consumers. Mr. Wilson said the Gas Committee were quite alive to the fact that they must hold the balance fairly between the consumers and the ratepayers. The Council had risked £80,000 in the gas undertaking; and it seemed ridiculous not to allow them 1 per cent. on the amount. The report was approved.

LOUGHBOROUGH GAS SUPPLY.

Estimates for 1901-2—The Unaccounted-for Gas.

At the last Meeting of the Loughborough Town Council, the Gas Committee reported that the Manager (Mr. E. Onions) had presented a statement showing the revenue account for the years 1899-1900 and 1900-01, together with his estimate of expenditure and receipts on the account for the current year. It was resolved to lay before the Finance Committee, for their information in framing the estimates, the following figures of the probable expenditure and receipts in connection with the Gas Department during the year ending March 31, 1902: Receipts, £17,371 12s. 8d.; expenditure, £13,292 13s. 4d.; balance, £4078 19s. 4d. Against the estimated balance were set the charges of £6380 18s. 4d. on capital account, leaving a deficit of £2301 19s. to be met out of the general district rate. Alderman Bumpus referred to the discussion at a former meeting of the Council, when it was reported that during the past quarter 2,700,000 cubic feet of gas were unaccounted for, or a percentage of 8·1 of the make, compared with 2·19 per cent. in the previous corresponding quarter. He said, as a matter of fact, gas unaccounted for was not altogether identical with leakage. It meant the difference between the gas measured when it was manufactured and that which passed through the meters. A percentage of 8·1 of gas lost was not at all unusual, as would be seen by figures which could be produced, either for Loughborough or elsewhere. At Newcastle it had been 10·1; at Salford, 9; at Dublin, 10·9. Still there was undoubtedly a contrast between 8·1 and 2·19. He inquired if the Manager could throw any light upon it; and he replied that in the corresponding quarter a year ago the Gas Company, in order to facilitate the preparation of the accounts, in view of the transfer, took the meters three days later, with the result that three days' gas was thrown out of one quarter into another. Since the Corporation had taken over the works, the pressure had been increased owing to the complaints which were made; and this meant more leakage. They believed, too, that, owing to the higher pressure, the public lamps were burning more gas than was paid for. On one half mile of main they only had one consumer, which meant that the main was put in too soon, and caused a loss. They would like to replace one of their gasholders which leaked; but they could

not incur capital expenditure at the present time. Matters at the gas-works required continuous attention; but there was no evidence that the leakage indicated laxity or inefficient management. In reply to Mr. Clifford, Mr. Onions said the leakage in the corresponding quarter of 1898 was 6·79 per cent. In the quarter before the works were taken over, the percentage was 15; but there was always a greater loss in the summer months. The matter then dropped.

THE ADDITIONAL GASHOLDER SCHEME FOR CATERHAM.

We learn from Mr. G. W. Anderson, the Engineer and Secretary of the Caterham Gas Company, that Mr. Ingram B. Walker, the Inspector of the Board of Trade who conducted the recent inquiry into the application of the Company for a Provisional Order to enable them to extend their area so as to include the parish of Woldingham, and to erect two gasholders in a chalk-pit situate at the rear of the Public Hall, Godstone Road, has made his report. An account of the proceedings at the inquiry appeared in our issue for the 26th ult. Mr. Walker states that he has inspected the gas-works site, and finds there is no room for additional gasholders there, and that the present storage accommodation is inadequate. As to the chalk-pit site, he remarks that the Company's witnesses showed that the proposed holders would cause no smell or depreciation of property; but the expert valuers for the opposition thought that depreciation of property round the pit would result. The residents in only some four or five houses might be able to see the holders. Notwithstanding, the Inspector thought the consent of the District Council should not be dispensed with, and this had been withheld in consequence of the opposition of the residents in the locality.

THE COAL AND IRON ORE TRADES OF SOUTH WALES.

A Gloomy Outlook.

The Newport (Mon.) Harbour Board had to discuss, last Wednesday, a serious question introduced by Mr. T. Canning, the Engineer of the Gas Company. He called the attention of the Board to the condition of the trade of the port, particularly in regard to the imports of iron ore, which had shown a great falling off in the first three months of the present year. He quoted the following figures for the corresponding period of the past five years: 1896, 112,568 tons; 1897, 138,174 tons; 1898, 101,365 tons; 1899, 140,344 tons; 1900, 134,906 tons; and 1901, only 56,088 tons. He hoped this decline was only temporary; and he noticed with satisfaction that the makers of iron and steel in the district did not seem to have lost all confidence, for although blast-furnaces were out at present, they were building new ones. The exports of coal had also fallen off to some extent; and in this matter Newport did not appear to be much worse off than neighbouring ports. Swansea, however, was the only one which showed an increase. The Chairman (Mr. T. E. Watson) said the exports of coal for January and February were heavy, but in March they went down considerably. The reason of this was that in March the contracts which had been made at good prices were out. Now they were beginning to see the state of things in which coal could not be sold at the price of production, and there must be a diminution of the output and of the export. He thought they would see a bad year in the coal trade. To show how the shoe pinched, he instanced the fact that, concurrently with the rise of 5 per cent. granted to the South Wales miners, the Conciliation Board at Newcastle had reduced wages 13¾ per cent.; and it was possible to buy best steam coal in the North 3s. to 4s. per ton cheaper than in South Wales. The increase in the cost of production had gone up far in excess of the wages. They would not have an improvement in the coal trade until they saw the cost of wages put upon something like more equitable terms in comparison with the price realized. According to the wages, the increase in the cost of labour between February, 1900, and February, 1901, ought to have been about 50 per cent. As a matter of fact, it was nearly double in the collieries with which he was connected. Another consideration was this: Although the number of men employed showed an increase of something like 11 per cent., there had been a diminution in the total quantity of work of something like 10 per cent. Their workmen had not yet been educated up to the standard of the Americans, who, though they received far higher wages, applied their labour so intelligently that the cost of production was much less than it was in England with the lower wages. The Labour leaders had not yet got rid of the heresy of attempting to permanently increase the price of coal by the artificial means of restricting the output. As regarded the imports of iron ore, the river had not suffered so much as the dock; and he thought this supported his contention that they ought to improve their river facilities. He held to the opinion that they would see in Newport what had taken place in the Cleveland district. They might expect the removal of works from the hills to the sea, and sooner or later they would see steel-works on the banks of the Usk. It was bound to come, because there were advantages in nearly every respect, except from the point of view of labour. Labour was dearer at Newport than in the hill district. A smaller number of men would be needed; but greater skill was required than before. Mr. W. J. Orders, referring to the iron ore imports, said he did not think that Newport had suffered more than other places. The importations to all the ports had been less during the last six months than he ever remembered. American competition had done a great deal of harm, as they all knew; and their local works were practically at a standstill. The importation of iron ore from Bilbao alone had decreased to such an extent that, whereas only twelve months ago some hundreds of boats traded to Cardiff and Newport alone, at present there was not a boat trading from that port to Newport. He really did not know where to look for improvement, unless, with the drop in the prices of coal, and the modified ideas of the Spaniards, the works might be able to see a chance of making a profit and going on again. But this seemed a long way off. Mr. Canning expressed the indebtedness of the Board to the Chairman and Mr. Orders for the information they had given.

ELECTRIC LIGHTING NOTES.

The Dorking District Council last Thursday approved of a deed of transfer of their electric lighting powers to the West London Electric Supply Company, Limited. One of the stipulations is that the works are to be completed within eighteen months from the date of the Board of Trade's sanction to the transfer.

The Local Government Board have sanctioned the application of the Heywood Corporation for a loan of £15,000 for electric lighting purposes; but they have finally declined to allow a loan of about £2000 for the free wiring of consumers' premises, on the ground that the granting of powers for such a loan would establish a precedent.

The Electricity Committee of the Manchester City Council are going earnestly to work to remove the difficulties into which their department has fallen. For the first installation in their new station, they have invited tenders for plant equal to 15,000-horse power. This is only a quarter of the capacity of the plant for which the station has been designed.

The Wallasey District Council having applied to the Local Government Board for permission to borrow various sums of money—among them £12,500 for electric lighting work—Colonel J. T. March held an inquiry last Wednesday. There was no opposition. It was stated by the Chairman of the Electrical Committee (Mr. R. M'Geoch) that the Council made a profit on their electrical as well as on the gas and water undertakings.

A paragraph appeared in the "Notes" in the "JOURNAL" for the 5th ult., in which an explanation was made regarding the curious position of an application by Mr. Peterson for a Provisional Order for constructing electric lighting works at Carnarvon. To complete the story, it may be stated that the Board of Trade have refused the application; and consequently Mr. Peterson regards himself as having been very badly treated.

The electric lighting plant at King's Lynn is being extended—the original machinery having been found inadequate. A feature of the old plant is that it consists of five large gas-engines, each driving a dynamo of 40 kilowatts. To these are now being added two steam dynamos—one of 120 kilowatts capacity, and the other of 200 kilowatts. The smaller set has already been fixed, and it was brought into service last Wednesday.

Inquiries are sometimes made as to the small towns in which the electric light undertaking is a burden upon the rates. Nuneaton, in Warwickshire, with its 15,000 population, is one of the number. In his annual report, the Surveyor (Mr. J. S. Pickering) states that the gross revenue from the works is only £868 15s. 6d., and the annual interest and repayment on the £18,000 loan (borrowed by the District Council for purchasing and extending the works) amounts to £1169.

The Lowestoft Town Council are shaking hands with themselves over the custom they have already obtained for their electric lighting works. Including private and public lighting and motive power, they have already connected the equivalent of 5570 8-candle power lamps. Besides several applicants are waiting to be connected; but it is unsafe to take these on until extensions have been made. A large connection does not always mean financial success; the lamps may be fixed, but little used.

The Barnsley Corporation have had an exceptional and noteworthy experience with their electrical venture. Mr. Brady announced, at the meeting of the Council last Wednesday, that the output of the works during the first year had been 200,112 units, or half as much again as it was expected they would have at the end of three years' working. They had met all charges, including two years' sinking fund charges of £685 a year, only one of which was really debitable to the past year, and had a balance of £8 0s. 11d. to carry forward. They had not had to draw anything from the rates, and were able to reduce the charges for lighting. Hitherto the charge had been 7d. per unit the first hour, and 3d. per unit afterwards. They proposed alternative systems of charging 4½d. per unit, and 7d. per unit the first hour, and 2d. per unit after the first hour.

A special meeting of the Malvern Urban District Council was held a few days ago to further discuss electric lighting questions. The Provisional Order was granted in 1890, and the Electric Light Committee, recognizing the futility of obtaining a further extension of time to comply with its provisions, recommended the Council to approve an electric lighting and refuse destructor scheme prepared by the Surveyor (Mr. H. P. Maybury). Dr. Dixey said the Order would shortly expire, and it was useless to expect further grace. Private enterprise should not be allowed to compete with the Council's gas undertaking. The electric lighting plant would cost £14,000, and the refuse destructor £3000. The schemes would go well together, and it was believed the lighting would be a paying concern from the start. It was decided to take the opinion of the ratepayers on the matter.

The Halifax Corporation have agreed with a proposal of the Electricity Committee that, from the 1st inst., the charge for electricity for lighting purposes, be at the rate of 4d. per unit to all consumers of under 7500 units per quarter, and to consumers of 7500 units and upwards per quarter, 3d. per unit, with a discount of 5 per cent. on all accounts, if paid within the prescribed time. Further, that the charge for the supply of electricity for power purposes be at the rate of 2d. per unit. It passed the comprehension of some of the councillors as to why the Committee should offer to supply current at 2d. per unit for power purposes while they charged the Tramways Committee 2½d. per unit. The explanation tendered was that the plant required for the generation of the tramway current was almost entirely used for tramway purposes; while the plant for the generation of electricity for power could also be used for lighting purposes. A day load on the lighting station could be accomplished at a profit at 2d. per unit, whereas the Engineer maintained that even at 2½d. per unit there was hardly any profit on the tramway current. Still certain members could not see it.

Colonel W. Langton Coke, one of the Local Government Board's Inspectors, has inquired into an application by the Cheltenham Town Council for a loan of £6150 for the purposes of electric lighting. The loans already sanctioned amount to £122,055, of which sum £110,258 has been spent. The Borough Electrical Engineer (Mr. Kilgour), in

explaining the progress of the undertaking, stated that on the 31st of March, 1896, the number of customers for the light was 101; now the number was 490. The supply was equivalent at the end of the first year to 6000 8-candle power lamps; the number at present was 30,000. Private customers in the first year used 47,000 units; and in the current year about 300,000 units. Commencing with two arc lamps, the number of such lamps now in the streets was 260; and it was intended to bring the total up to 440. There were also, he added, a few incandescents. As to the working profits of the undertaking (*exclusive* of interest and sinking fund), there was a deficit of £620 on the first year; the next year a small profit was made; in the following a profit of £1250 was made; in the succeeding year the profit was £2150; and in the next roughly £3300. There was no opposition to the proposed outlay.

On Good Friday, an accident of an alarming nature, exemplifying the constant risk of injury to which people are exposed from overhead telegraph, telephone, and tramway wires, occurred in Huddersfield. Mr. Thomas Bean was driving, through the New North Road, a horse attached to a four-wheeled trap, in which were seated his wife and a Mr. and Mrs. Thompson. On nearing the bottom of the road, Mr. Bean noticed, a short distance in front, at the top of Westgate, a telephone or telegraph wire drop. Seeing this was dangerous, he turned his horse to go up West Parade. The horse, however, came in contact with the wire; and before the animal could be stopped, the wire was drawn down on the Corporation tramways trolley wire. A blue flame ran along the telephone wire across the breast of the horse, which backed, plunged forward, and upset the trap—the four occupants being thrown on to the road. Mrs. Thompson sustained a fracture of the left arm, and a severe shock. The vehicle was also much injured. It appears that, at the time of the accident, some men in the employ of a local electrical engineer were engaged in removing telephone wires, and it was one of these that broke; and when it was drawn on to the tramway trolley wire, it fused, and gave a shock to the horse which caused it to plunge and upset the trap. Portions of the telephone wire were burnt through.

A little passage of arms has lately taken place between Mr. G. H. Verrall, J.P., the Chairman of the Newmarket Electric Light Company, and Mr. R. Stephenson, who occupies a corresponding position in the Gas Company. The latter gentleman was twitted by the former with persisting in the "extraordinary statement" that his Company could supply gas at 1-15th the cost of electric light, and also with declining to take up the challenge thrown down to him to prove it. Mr. Stephenson acknowledged that he did so; and he renewed his offer to employ experts to visit Newmarket to prove or disprove, at their joint expense, the truth of his assertion. His proposition was put in the clearest terms—viz., that when gas costs 3s. 8d. per 1000 cubic feet, and electric light 7d. per unit, as much light can be got out of the gas for 1s. as can be got out of electricity for 15s., the best incandescent burners being used in each case. This is the statement which the electricians have to disprove. Mr. Verrall went on to say that the electric light in his own house did not cost him more than he formerly paid for gas. This was not a happy remark, for Mr. Stephenson recalled to his mind the explanation he gave last year of the way in which he managed to produce this result. When leaving a room he switched off the electric light, but did not turn off the gas—an excellent method of showing the economy of one illuminant as compared with another. A further point against gas was that Mr. Verrall had used the old-fashioned flat-flame burners; but Mr. Stephenson informed him that if he had adopted the modern Kern burner he would have had seven times as much light as he obtained with his old appliances, without consuming any more gas, and, moreover, would by so doing have proved the correctness of his opponent's statement, as to the relative cost of gas and electricity. Mr. Verrall has only two gas-burners left in his house, and he professes to be in "fear and trembling" lest one should set his house on fire. Mr. Stephenson suggests that when he has removed them he might ask the insurance company to reduce his premium, and let the public know the result of his application.

Islington (says the "Pall Mall Gazette") has been for some time past much concerned about its electric lighting undertaking; and at the meeting of the Borough Council on Friday an exhaustive and, it must be said, a reassuring report was presented to the members upon the subject. What the public locally has wished to know is why the Council's system—established at an outlay of over £250,000—has not, so far, been making a profit like other municipal systems. The Electric Lighting Committee, in the course of their inquiry, have compared the Islington undertaking with those of St. Pancras, Shoreditch, Hammersmith, and Hampstead, and as a result support their conclusions by several interesting tables, in which the initial cost, maintenance charges, the output, and receipts in these several places are contrasted. The main reasons why the Islington system has hitherto failed to be as remunerative as others, are the small private consumption and a relatively large expenditure in capital and wages. It is from the private consumption the profits arise, and not from an output the greater part of which goes in public lighting; and that is what has been happening in Islington, where practically 50 per cent. was applied to street lighting in 1899, while the proportion in Hampstead was only 8, in St. Pancras 14½, and in Shoreditch 22 per cent. Taking the number of private consumers in each of these boroughs, the receipts from that source, and the net profit in 1899, the importance of getting the electric light into the homes of the principal residents will appear even still more clearly, as witness the following figures :—

Borough.	Number of Consumers.	Receipts from Private Consumers.	Total Receipts.	Capital Expenditure.	Net Profit for the Year.
		£	£	£	£
Islington . . .	497	15,636	25,401	259,562	381
St. Pancras . . .	1184	37,790	44,726	288,147	6842
Shoreditch . . .	595	16,771	22,036	170,383	563
Hampstead . . .	1671	28,884	30,740	162,212	9357
Hammersmith . .	464	10,347	13,739	104,498	1615

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 991.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 12	10½	Alliance & Dublin 10 p.c.	19—20*	..	5 5 0
100,000	10	,,	7½	Do. 7 p.c.	13—14*	..	5 7 2
300,000	100	Jan. 2	5	Australian 5 p.c. Deb. .	99—101	..	4 19 0
200,000	5	Nov. 14	6	Bombay, Ltd. . . .	6—6¾	..	4 12 4
40,000	5	,,	6	Do. New, £4 paid	4¼—4¾	..	5 6 8
380,000	Stk.	Feb. 14	12	Brentford Consolidated	260—265	..	4 10 7
270,000	,,	,,	9	Do. New . . .	187—192	..	4 13 9
50,000	,,	,,	5	Do. 5 p.c. Pref. .	128—132	..	3 15 9
159,375	,,	Dec. 13	4	Do. 4 p.c. Deb. .	113—116	..	3 9 0
220,000	Stk.	Mar. 14	10	Brighton & Hove Orig.	222—227	..	4 8 1
226,320	,,	,,	7	Do. A. Ord. Stk. .	160—165	..	4 4 10
1,022,500	Stk.	Feb. 27	5	Bristol, 5 p.c. max. .	121—123	..	4 1 4
420,000	20	Mar. 28	10	British.	40—41*	..	4 17 7
50,000	10	Feb. 28	12	Bromley, Ord. 10 p.c. .	24—26	..	4 12 4
79,000	10	,,	9	Do. 7 p.c. . . .	19—21	..	4 5 8
500,000	10	Oct. 12	6	Buenos Ayres (New) Ltd.	9—10	..	6 0 0
220,000	Stk.	Dec. 28	4	Do. 4 p.c. Deb.	97—100	..	4 0 0
150,000	20	Mar. 14	8½	Cagliari, Ltd. . . .	22—24	..	6 17 6
100,000	10	Sept. 28	8	Cape Town & Dis., Ltd	14½—15½	..	5 3 3
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	53—55	..	5 9 1
550,000	Stk.	Apl. 12	12	Commercial Old Stock	275—280*	+3	4 5 9
236,425	,,	,,	9	Do. New do. .	207—212*	+1½	4 4 11
238,237	,,	Dec. 13	4½	Do. 4½ p.c. Deb.	130—135	−2	3 6 8
800,000	Stk.	Dec. 13	9	Continental Union, Ltd.	165—170	..	5 5 11
200,000	,,	,,	7	Do. 7 p.c. Pref.	163—168	..	4 3 4
575,000	Stk.	Feb. 28	5	Crystal Palace Ord. 5 p.c.	115—120	..	4 2 0
60,000	,,	,,	5	Do. 5 p.c. Pref.	127—132	..	3 14 1
486,090	10	Jan. 31	11	European, Ltd. . . .	20—21	+½	5 4 9
354,060	10	,,	11	Do. £7 10s. paid	14½—15½	..	5 6 5
15,079,885	Stk.	Feb. 14	4 7/10	Gas-light and Coke	4 p.c. Ord. . .	93—96	..	4 11 8
2,600,000	,,	,,	3½		3½ p.c. max. .	89—92	..	3 16 1
3,799,735	,,	,,	4		4 p.c. Con. Pref.	109—112	..	3 11 5
4,063,425	,,	Dec. 13	3		3 p.c. Con. Deb.	93—95	..	3 3 10
70,000	10	Oct. 26	8	Hongkong & China, Ltd.	13½—14½	..	5 10 4
3,800,000	Stk.	Nov. 14	10	Imperial Continental .	210—215	..	4 13 0
473,600	Stk.	Feb. 14	3½	Do. 3½ p.c. Deb. Red.	100—102	..	3 8 8
561,000	Stk.	Feb. 28	10	Liverpool United A .	234—236	−½	4 4 9
678,100	,,	,,	7	Do. do. B .	170—173	..	4 0 11
306,083	,,	Dec. 28	4	Do. do. Deb. Stk.	120—122	..	3 5 7
75,000	5	Dec. 13	6	Malta & Medn., Ltd. .	4¾—5¼	..	5 14 3
560,000	100	Apl. 1	5	Met. of	5 p.c. Deb.	104—107	..	4 13 5
250,000	100	,,	4½	Melbourne	4½ p.c. Deb.	102—104	..	4 6 6
541,920	20	Nov. 14	3½	Monte Video, Ltd. . .		9¾—10½	..	6 13 4
717,946	Stk.	Feb. 22	8½	Newc'tle & G'tesh'd Con.		225—227	..	3 14 11
312,855	Stk.	Dec. 28	3½	Do. 3½ p.c. Deb.		101—102	..	3 8 8
150,000	5	Nov. 29	8	Oriental, Ltd. . . .		7—7½	..	5 6 8
135,000	5	,,	8	Do. New, £4 10s. pd.		6—6½	..	5 10 9
15,000	5	,,	8	Do. do. 1879, £1 pd.		1¼—1⅝	..	4 11 5
				*Ex. div.			
60,000	5	Feb. 28	7	Ottoman, Ltd. . . .		5⅜—6¼	..	5 12 0
851,070	10	Oct. 12	7	River Plate Ord. . .		10½—11¼	..	6 4 5
250,000	Stk.	Dec. 28	4	Do. 4 p.c. Deb. .		97—99	..	4 0 10
250,000	10	Mar. 28	8	San Paulo, Ltd. . . .		11—12	..	6 13 4
135,000	Stk.	Mar. 14	10	Sheffield A		235—240	..	4 3 4
209,984	,,	,,	10	Do. B		234—236	..	4 4 9
523,498	,,	,,	10	Do. C		234—236	..	4 4 9
5,761,885	Stk.	Feb. 14	5	South Met., 4 p.c. Ord.		126—129	..	3 17 6
1,547,965	,,	Jan. 16	3	Do. 3 p.c. Deb. . .		93—96	..	3 2 6
380,940	Stk.	Nov. 14	5	Southampton Ord. . .		108—113	..	4 8 6
70,825	,,	Jan. 16	4	Do. 4 p.c. Deb.		105—110	..	3 12 9
120,000	Stk.	Feb. 28	6	Tottenham and Edmonton	A. 5 p.c.	112—117	..	5 7 8
250,520	,,	,,	4½		B. 3½ p.c.	84—89	..	5 0 0
80,100	,,	Dec. 13	4		4 p.c. Deb.	109—114	..	3 10 2
182,380	10	Jan. 16	5	Tuscan, Ltd. . . .		8—9	..	5 11 1
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.		97—102	..	4 18 0
230,000	5	Feb. 28	9	West Ham, 10 p.c. . .		9—10	..	4 10 0
147,000	10	,,	6	Do. 7 p.c. . .		11½—12½	..	4 16 0
128,984	Stk.	Dec. 28	4	Do. 4 p.c. Deb.		105—110	..	3 12 9
				WATER COMPANIES.			
780,499	Stk.	Dec. 28	11	Chelsea, Ord. . .		295—300	..	3 13 4
150,000	,,	,,	5	Do. 5 p.c. Pref. .		155—160	..	3 2 6
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75		142—145	..	3 2 1
175,785	,,	Mar. 28	4½	Do. 4½ p.c. Deb. .		140—145	..	3 2 1
1,720,560	Stk.	Apl. 12	7	East London, Ord. . .		188—193	+1½	3 12 6
654,740	,,	Dec. 13	4½	Do. 4½ p.c. Deb. .		145—150	..	3 0 0
797,687	,,	,,	3	Do. 3 p.c. Deb. .		95—97	..	3 2 6
700,000	50	Dec. 13	8	Grand Junction	10 p.c. max.	107—110	..	3 12 9
310,000	Stk.	Mar. 28	4		4 p.c. Deb.	123—127	..	3 3 0
708,000	Stk.	Feb. 14	14	Kent		300—305	..	4 12 5
160,000	,,	,,	7	Do. New, 7 p.c. max.		200—205	..	3 8 4
1,043,800	100	Dec. 28	10½	Lambeth, 10 p.c. max.		270—280	..	3 15 0
406,200	100	,,	8	Do. 7½ p.c. max.		207—212	..	3 15 5
350,000	Stk.	Mar. 28	4	Do. 4 p.c. Deb.		123—126	..	3 3 6
500,000	100	Feb. 14	13⅓	New River, New Shares		407—412	+2	3 6 9
1,000,000	Stk.	Jan. 31	4	Do. 4 p.c. Deb.		125—130	..	3 1 7
902,300	Stk.	Dec. 13	7	South-wark and	Ord. . . .	188—193	..	3 12 6
126,500	100	,,	7		7½ p.c. max.	175—180	..	3 17 9
489,200	Stk.	,,	5		5 p.c. Pref. .	155—160	..	3 2 6
1,019,585	,,	Apl. 12	4	Vauxhall	4 p.c. A Deb.	124—128	..	3 2 6
1,155,066	Stk.	Dec. 13	10	West Middlesex. . .		265—275	..	3 12 9
200,000	,,	,,	4½	Do. 4½ p.c. Deb. .		140—145	..	3 2 1
200,000	,,	Mar. 14	3	Do. 3 p.c. Deb. .		96—98	..	3 1 3
				*Ex. div.			

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

This year's spring meeting of the Waverley Association of Gas Managers was shorn of much of its worth by the action of the President (Mr. W. M'Giffen, of Huntly) in absenting himself. His place was taken, for the second time, by Mr. A. Bell, sen., of Dalkeith, a sturdy supporter of the Waverley Association, and of all associations, who, quite a host in himself, did all he could to prevent the day being a blank. He had fortunately invited Mr. W. Carmichael Peebles, of Edinburgh, to show the members the working of the Scott-Snell lamp. This enabled a happy hour to be spent. The new President (Mr. A. C. Young, of Kelso) is one of the rising managers of the day, and under him the Association is certain to flourish. He has, since he went to Kelso, almost reconstructed the gas-works, and has greatly improved the working of them, which has resulted in a large saving. Mr. Young was formerly at Maybole, and at Auchterarder, at both of which places he executed engineering works, designed by himself. Mr. Young's place as Secretary is taken by Mr. L. Bell, of Innerleithen, whose ingenuity is beyond compare. Mr. Bell is a son of the venerable Manager at Dalkeith, as is also Mr. A. Bell, of Peebles; and thus there is the interesting experience of a father and two sons being members of the Association.

The Edinburgh and Leith Gas Commissioners have completed their purchase of coal, oil, and lime for the year from May 16 next. At their meeting yesterday, the Chairman (Mr. Purves) said that they had obtained the coal and the oil at more satisfactory prices than they were now paying. It was cannel which they were purchasing. The reduction in price is 1s. per ton. Last week splint was bought at a reduction, on an average, of 4s. 1d. per ton. I see it stated in a newspaper correspondence that Mr. Herring, the Engineer, has, by his purchases, saved £12,000 to the Commissioners. The saving is probably more than double this sum. Had it not been for statutory requirements, in the matter of advertising and publication, the prices would have been still more favourable to the Commissioners. Cannel, for instance, should have been down 5s. per ton, instead of 1s. But, taking matters as they are, the purchases which have been made are a credit to all concerned. The tenders for cannel were considered by the Committee several days before the meeting on Friday. There was, accordingly, no ground for complaint, such as was lodged by Provost Mackie, of Leith, and others, the previous week. Yet, although their ground of complaint had been removed, the malcontents were not present.

The Commissioners have concluded arrangements for the borrowing of £350,000, on terms which are not exorbitant. This should about complete the capital account of the Commissioners, which will now stand at £1,111,000. The rate of expenditure is about £580 per million cubic feet of gas made.

The Peebles Gas Commissioners have this week committed themselves to the important step of having the gas-works removed to a new site. The place which has been selected is on the left bank of the River Tweed, about 1¼ miles below the town. It lies between the railway and a high bank upon the top of which is the public road to Galashiels. About 4 acres of land will be taken, which will give space for almost any conceivable increase in the consumption of gas in the district. In such a place as Peebles, amenity is a matter of great consideration. The new works will satisfy the most fastidious upon this score, for they will be so surrounded by wood as to be out of sight of everywhere. The formation of the ground will allow of a high-level railway being constructed into the works. It will not be necessary to obtain parliamentary powers for the construction of the new works, which may thus be begun immediately.

The resolution to erect new works was arrived at after perusal of a report by the Manager (Mr. A. Bell, jun.), prepared in September last, upon the existing works. In this report Mr. Bell said: "The phenomenal success of the scheme instituted by the Gas Commissioners last year for popularizing the use of gas in Peebles, has brought about such an increase in the consumption that the plant at the gas-works is now strained to its utmost extent; and it is therefore urgently necessary that the Committee should consider what steps are to be taken to cope with this increasing demand. For the purpose of comparing the recent increase in consumption with that of previous years, I have prepared the following table, showing how the consumption has varied during the ten years preceding May, 1899: In 1890 there was an increase of 10 per cent.; in 1891, of 6·7 per cent.; in 1892, of 6·1 per cent.; in 1893 there was a decrease of 9·7 per cent.; in 1894, of 1·4 per cent.; in 1895 there was an increase of 2·4 per cent.; in 1896, of 9 per cent.; in 1897, of 10·1 per cent.; in 1898, of 0·9 per cent.; and in 1899, of 8·3 per cent. It will thus be seen that there has been an increase every year except in the years 1893 and 1894; that being the time when the oil-gas enrichment process was introduced. The decrease on these two years can therefore be accounted for by the considerably higher quality of the gas which was then supplied. A rise in quality is, of course, always followed by a fall in consumption; and, but for this, I believe there would have been an increase on these two years as on the others. Leaving out of account, therefore, the decrease on these two years, and spreading the total increase over the whole ten, we find that the average yearly increase has been at the rate of 5·3 per cent. But for the year which closed on May 15 last, the increase in the consumption was 30·2 per cent., or not less than three times the greatest increase for any one year, and almost six times the average increase of the ten years This great increase necessarily caused a very great strain on the works, which was felt worst of all at the close of the month of December last. The make then rose so high as 101,000 cubic feet per day; and to produce this, the plant was taxed to its utmost power. . . . In the retort-house, five out of six ovens of retorts were in use at one time, leaving only one oven as a reserve, which is not sufficient for safety or economy in working. The condenser was quite unequal to the make of gas; and at present a spray of water has to be used to assist the cooling action. The purifiers, which are only 8 feet square, were pressed much beyond what it is economical to do. The maximum

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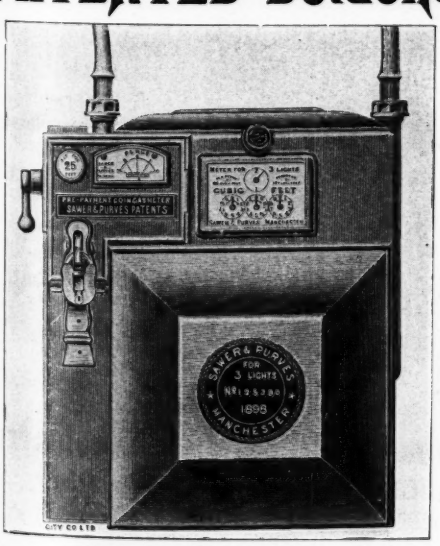


Meter in working position.

Meter with attachment removed without uncoupling.

power of these purifiers is stated at from 60,000 to 70,000 cubic feet per day, which allows sufficient time in the passage of the gas for the removal of the impurities, and for the complete utilization of the purifying material. The result of working the purifiers at a greater rate than this, is that the gas passes away imperfectly purified, and the purifying material is only partially used when it has to be removed. The station meter has a measuring capacity of 5000 cubic feet per hour; and last winter there were times when it was working to its full capacity. The greatest deficiency of all, however, is in the gasholder storage. It is generally admitted that storage capacity equal at least to the maximum daily make of gas is necessary, so as to have a margin of safety in the event of a sudden extra demand for gas arising, as in foggy weather, or in the event of a hitch occurring in the works. In our case, the total capacity of the three holders amounts to 43,000 cubic feet, or only 42 per cent. of the maximum make. It is thus evident that during last winter, not only was there no reserve of power, but the plant had to be pressed to its utmost to be equal to the maximum daily demand." Mr. Bell estimated that the cost of renewing the works upon the existing site would amount to £8273; and they would then, at the present rate of increase in consumption, serve for fourteen years. When that time arrived, it would be necessary to remove the works. He estimated that to erect works capable of producing 40 million cubic feet of gas per day will cost about £11,000, exclusive of the cost of site and railway connections. In a further report, written last month, Mr. Bell points out that since May 15 last, there has been an additional increase of 15·6 per cent.; making a total increase, in two years, of not less than 52 per cent. This great increase, I may explain, is due to the introduction of gas-cookers, which have been taken up almost universally. Out of 900 consumers, 800 have had gas-cookers fitted. It is said that on one occasion a goods train ran into Peebles with nothing on board except gas-cookers.

At a meeting of the Bo'ness Burgh Commissioners this week, a letter from the Secretary of the Gas Company was read, in which contradiction was given to the statement made by a Commissioner, that the Directors of the Company had offered to sell the undertaking for £35,000, and also saying that the Directors were not disposed to enter into further negotiations for the transfer of the concern until the Commissioners should adopt the Burghs Gas Supply Acts. This means that the Company wish to be regarded as unwilling sellers, and to place the matter so that, if the Commissioners once begin, they must proceed to a finish with the transfer.

It is reported that since July 1 last, there has been a decrease in the consumption of gas in Greenock to the extent of 3,340,900 cubic feet, as compared with the previous year. This decrease has taken place notwithstanding that the population is increasing; over 4000 having been added during the last decade. The cause of the decline is a matter upon which there is a difference of opinion; but the most feasible theory is that it is due to some parts of the works being unequal to the call upon them. This will be remedied soon, because the Corporation are at the present time seeking parliamentary powers for a large extension of the works.

There is a deficiency in the municipal accounts of Paisley to the amount of £4723; and the Town Council, at a meeting this week, resolved to request the Gas Committee to make provision for meeting it. Paisley is about the only place in Scotland which follows this pernicious practice.

The new gas-works at Perth are to be formally inaugurated on Friday, the 26th inst. The desire of the Gas Committee to hold a banquet after the ceremony has given offence to some of the town councillors; and at a meeting on Tuesday, the proposal was only carried by the casting vote of Lord Provost Macgregor.

In the Glasgow Exhibition, as part of the lighting arrangements, there is being fitted up, by the Water Motor and Automatic Liquid Elevator Company, Limited, of which Mr. James Keith is the moving spirit, two of Keith's patent duplex automatic gas-compressors (worked by the city water service) in action, and supplying compressed gas for the lighting of the grounds by the Welsbach Gas-Light Company. These automatic gas-compressors were selected by, and constructed for, the Glasgow Gas Corporation for the purpose. They are silent in operation, supply 12,000 cubic feet of compressed gas per hour, and form the largest installation of the kind yet constructed. Keith's patent high-pressure incandescent gas-burners and other intensified gas-lighting devices, are to be shown at work at the exhibit. A large and handsome lantern, with a 1200-candle power gas-light in it (Keith's patent), will be erected in front of the compressor-house, and will illuminate the whole surroundings after dark. The apparatus was all constructed in the Arbroath works of the combined firms now named the James Keith and Blackman Company, Limited.

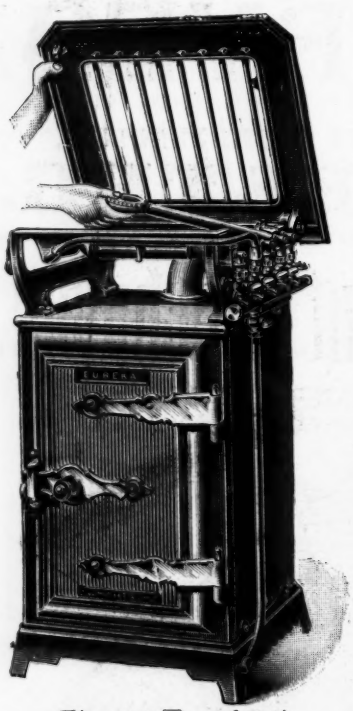
On Monday last, the Bo'ness Town Council inaugurated a new water supply which has been taken in from Lochcote, near Bathgate. The reservoir at Lochcote is capable of holding 200 million gallons. The total cost of the works has been £29,105. Messrs. J. & A. Leslie and Reid were the Engineers.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *April* 13.

Sulphate of Ammonia.—The market weakness in Scotland has been accentuated during the week; and as low as £10 2s. 6d. f.o.b. Leith has been accepted. The collapse has been caused by the anxiety to realize of makers who have had some accumulation of stock, and partly by the action of speculators who have been interested in depressing prices. Other markets have had to follow the decline; and, at the close, the quotations are £10 2s. 6d. per ton f.o.b. Leith, £10 5s. f.o.b. Hull, and £10 7s. 6d. f.o.b. Liverpool. In the forward position, no important first-hand business has transpired; but orders have been taken abroad speculatively at near the level of spot prices. There has been good inquiry; but buyers are aiming at still lower levels, and have been difficult to bring to business.

Nitrate of Soda is in good demand; but supplies are more than



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ample, and values are barely maintained. The closing spot quotations are 8s. 6d. to 8s. 9d. per cwt., according to quality.

LONDON, *April* 13.

Tar Products.—The markets are very quiet, doubtless owing to the holidays. Benzol is decidedly weak; and it is difficult to fix the actual value of 90 per cent. Probably the best way will be to take it as 9d. per gallon at makers' works, while 50 to 90 per cent. is nominally worth a little under. Solvent naphtha remains in the same position, although some contracts are reported, for spring delivery, for Continental account. Crude carbolic remains in about the same position; but crystals have a slightly firmer tendency, probably owing to the improved demand for picric acid. Anthracene remains in the same position. Naphthalene salts continue quiet, and prices unchanged.

The average values obtaining during the week are: Tar, 14s. 6d. to 17s. 6d. Pitch, east coast, 30s. to 30s. 6d.; west coast, 28s. Benzol, 90's, 9d. to 10d.; 50's, 9d. to 10d. Toluol, 1s. to 1s. 1d. Crude naphtha, 4d. Solvent naphtha, 1s. 1d. Heavy naphtha, 1s. Creosote, 1d. to 1¼d. Heavy oils, 1¾d. to 2d. Carbolic acid, 60's, 2s. 6d. Naphthalene, 90s. Salts, 60s. Anthracene, "A," 3d.; "B," 2d.

Sulphate of Ammonia.—There is nothing doing for export; but there appears to be a good demand for home consumption. The Beckton price is now £10 7s. 6d. per ton, but other London Companies have accepted £10 3s. 9d., Beckton terms. A few small orders were placed at Hull for prompt shipment at £10 5s.; and this may be taken as the value at Leith, although at present consumers decline to pay same.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—No new development can as yet be reported in connection with the coal trade of this district. The curtailment of the output during the recent stoppages of the pits has, for the moment, tended to steady the position, and has temporarily given a check to the downward move in prices. The better qualities of round coal, in fact, are absolutely scarce; but this is a situation which will very soon be remedied as the summer advances. For the present, however, prices are being firmly maintained at the full list basis of about 16s. to 17s. per ton at the pit for best Wigan Arley, 14s. 6d. to 15s. for Pemberton four-feet and seconds Arley, and 13s. to 14s. for common house coal. Common round coals, though not in more than moderate demand for steam and forge purposes, are also steady at late rates, ranging from about 10s. 6d. and 11s. per ton at the pit for medium, to 11s. 6d. and 12s. for some of the best qualities. There is nothing as yet passing through with regard to gas coals or locomotive fuel, to afford any basis as to probable prices at which contracts will be settled; nor has anything occurred to at all change the anticipations which have been referred to in recent reports. Of engine fuel there are ample supplies on the market; but Lancashire collieries are showing less disposition to quote anything below current rates, and it is exceptional where common slack could be bought under 7s. to 7s. 6d. per ton at the pit, with better qualities ranging from 8s. 6d. to 9s. 6d. There is, however, plenty of slack coming in from other districts at low figures; and any apparently stronger tone in Lancashire scarcely meets with much support elsewhere. In the Derbyshire district, slack is to be bought at from as low as 3s. and 3s. 6d. per ton at the pit, with Yorkshire and Staffordshire slack also freely offered at considerably below local quotations. The shipping trade continues quiet, with 12s. to 12s. 6d. per ton representing about the average prices for good ordinary qualities of steam coal, delivered at the ports on the Mersey. For coke, prices have steadied slightly; best Lancashire foundry qualities being quoted from 25s. to 26s. per ton, and good washed furnace coke from 12s. 6d. to 13s. at the ovens, while contracts have been made for Yorkshire furnace cokes with Lincolnshire furnaces at 9s. per ton at the ovens.

Northern Coal Trade.—The coal trade of the North is more active; and there has been a large amount of gas coals contracted for. In the steam coal trade, the demand is full; but now that the holidays are past, and the output has returned to the normal, there is an easier tendency. Best Northumbrian steam coals are from 12s. 3d. to 12s. 6d. per ton f.o.b., and steam smalls are 5s. 9d. to 6s. In the gas coal trade, contracts have been under negotiation for both the South Metropolitan and the Commercial Gas Companies; and, in the result, there have been a large number of tenders accepted at rates that vary from 8s. 9d. to 9s. 1½d. per ton f.o.b. for best Durham gas coals. Other large contracts are still to arrange; but it is expected that the prices will be similar. Very little gas coal is at present being sold on occasional cargoes. Coke is steadier, as there is a larger export, and one or two additional furnaces are now taking supplies Best Durham coke is quoted from 17s. 6d. to 18s. per ton f.o.b. Gas coke is now in lessened production; and the market is perhaps a shade firmer, though one sale has been reported on Newcastle Exchange at as low as 12s. per ton f.o.b.

Scotch Coal Trade.—The difficulty with the colliery engine-keepers has been overcome; and the pits are again all open. Full time cannot be given in many cases; and thus the resolution of the men to work only five days a week, is of no effect. Prices are again down to about what they were three weeks ago; and the general expectation is that they will go still lower. The quotations are: Main 9s. 3d. to 9s. 6d. per ton f.o.b. Glasgow, ell 10s. 6d. to 11s. 6d., and splint 10s. 6d. to 11s. The shipments for the week amounted to 145,884 tons—a decrease of 27,923 tons upon the previous week, and of 46,617 tons upon the corresponding week of last year. For the year to date, the total shipments have been 2,107,404 tons—a decrease of 446,533 tons upon the same period of the previous year.

The annual return of the Mexican Gas and Electric Light Company, Limited, was filed a few weeks ago, when the entire capital of £100,000, in £20 shares, had been taken up. There are mortgages and charges amounting to £95,000.

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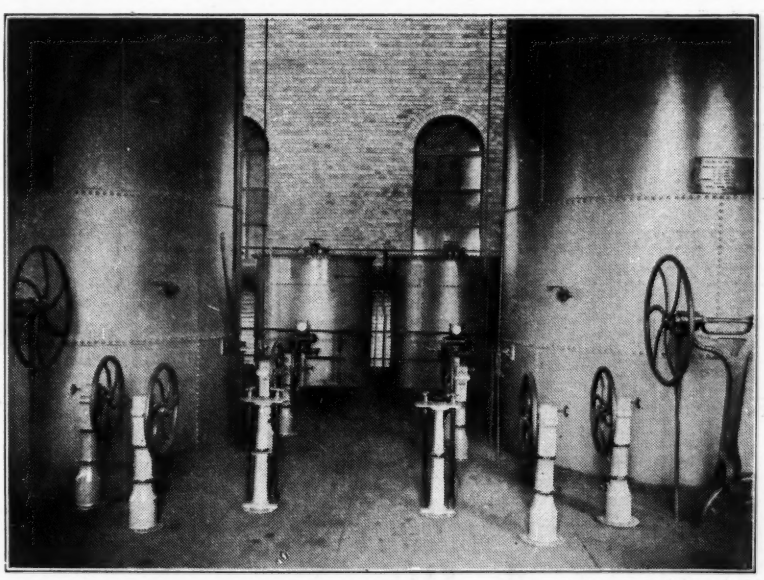

RESULTS PROVE EFFICIENCY.

Working Floor of Generator House. One Quarter Section of Birmingham Plant, Windsor Street Station.
The Maximum Daily Capacity of the Birmingham Corporation's Plant, which was erected by this Company, is 10 MILLION CUBIC FEET.

Softening Stockport Water.—The Stockport Corporation are carrying out an important scheme at their Wilmslow Water-Works, for the softening of the water supplied in the Wilmslow and Alderley Edge districts. The work, which will cost between £4000 and £5000, is being undertaken by Messrs. Mather and Platt, of Salford. Great complaints have for a long time been made respecting the extraordinary hardness of water in the districts named.

Leamington Gas-Works Purchase Question.—This matter again came before the Leamington Town Council at their meeting last Tuesday. A letter was read from the Gas Company, in which it was stated that the Directors were prepared, so far as they could legally do so, and subject to the rights of dissentient shareholders, to acquiesce in the Corporation taking the necessary steps for vacating the contract for the purchase of the gas-works. The Directors were advised by Counsel that an Act of Parliament was requisite for the purpose, and that the Bill should be promoted by the Corporation. The letter was referred to the General Purposes Committee.

Winsford District Council and the Gas-Works.—At a crowded meeting of Winsford property owners and ratepayers, held on Thursday, the Urban District Council asked for sanction to deposit a late Bill in Parliament to empower them to manufacture and supply gas and provide for the transfer to them of the local gas undertaking. Some time ago, the Council resolved to purchase the works for nearly £16,000, the price fixed by the Arbitrator. The Local Government Board, however, refused to sanction the loan unless a Provisional Order or Bill was obtained. After a long discussion, the ratepayers decided, by an overwhelming majority, to withhold consent. A poll was demanded, and it will take place early next month.

The Proposed Installation of Carburetted Water-Gas Plant at Carlisle.—At the meeting of the Carlisle Town Council last Tuesday, it was announced that Messrs. Corbet Woodall and Son had sent in designs and specifications for the proposed installation of carburetted water-gas plant. In the report which was enclosed, it was stated that they were complete for the adaption of the present buildings and their partial rebuilding, with the exception only of the foundations for the apparatus, pits, &c., which would necessarily be built to suit the water-gas apparatus. There was no reason why the building work should not be let and commenced as soon as a contract had been arranged. They advised that a few local firms of good repute should be invited to prepare tenders for this building work, as early completion of these buildings was important. They included the boilers and oil-tank in the contract for the carburetted water-gas plant, as this course would ensure the whole being completed together and under one liability, which in such a case was very desirable. They had sent a specification to Messrs. Humphreys and Glasgow for the whole of the water-gas plant and machinery. Their tender amounted to £5413; but the time available was not sufficient to include the oil-tank in the estimate, and this would probably cost about £325. They had gone carefully through the tender, and were able to say the amount was very reasonable for the work specified.

Gas v. Electric Lighting at Hull.—At a meeting of the Works Committee of the Hull Corporation held a few days ago to consider the question of lighting the new streets in the borough, one of the members was bold enough to declare that in no single city had electric lighting been a success. The incandescent gas system was, in his opinion, infinitely superior. The Chairman said the tradesmen would rather have incandescent gas than electric lighting, on account of its being more reliable. Personally he preferred it. The Committee decided to recommend the lighting of Prospect Street with 24 of Sugg's high-power lamps.

Thefts of Gas and Electric Current in the United States.—Some time ago, a law was passed with the object of preventing theft of gas and electric current from the mains and cables of the supply companies in the United States. The result has been the conviction of several offenders; one of them being sentenced to pay a fine of £50, with the alternative of 60 days' imprisonment. The "heathen Chinee" has been exercising his ingenuity in this direction. A number of Chinese laundries were entered not long ago, when the meters were found to have been so tampered with that the bills were only about half as much as they should have been; and nine of the laundrymen were arrested.

Gas and Electricity Officials Fraternize at the Antipodes.—The officials of the Australian Gaslight Company and the managers of the electrical firms in Sydney, New South Wales, are evidently on the best of terms; and whatever may be their private views respecting the rival lights with which they are associated, it does not interfere with them socially. For six years the Gas Company and the electrical firms have annually played a cricket match, the last taking place at the Sydney Cricket Ground on the 21st of February, under the most favourable circumstances as regards weather and attendance. Play commenced at 10.30 a.m., and Mr. Lee Murray (of Siemens's Electric Light Company), captain of the team representing the electrical firms, winning the toss, decided to send the members of the Gas Company's club to the wickets. The Company made 163 in spite of the wicket being somewhat treacherous, owing to the rain in the morning. In response, the electric team, at the call of time, had succeeded in putting together 123 runs for the loss of three wickets; the match, therefore, resulting in a draw. In former years it has been the custom to hold a luncheon in connection with the day's proceedings; but this was dispensed with on the present occasion in favour of a dinner and smoking concert, which took place at the close of the match, in the grand pavilion on the grounds. The chair was occupied by Mr. R. J. Lukey, Secretary of the Gas Company, and among those present was Mr. G. J. Cohen, the Chairman. After the usual loyal toasts had been duly honoured, Mr. Mack, Captain of the Gas Company's team, proposed "The Electric Team," to which Mr. Lee Murray responded, and proposed "The Gas Company's Team." Mr. Erskine (Crompton Company) then proposed "The Chairman;" and the toast having been honoured, a move was made to the hall, where a smoking concert was held, at which Mr. Lee Murray presided, and a most enjoyable evening was spent.

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CONDENSERS. **CRIPPS'S GRID-VALVE** **TAR BURNERS.**

SIEVES. For bye-passing the lower layer in Purifiers. **VALVES.**

TYSOE'S SELF-SEALING MOUTHPIECES.

Tar-Distilling Plants. **Claus' Sulphur-Recovery Plants**

SULPHATE OF AMMONIA PLANTS.

Barnsley Water Supply.—Moving the adoption of the report of the Water Committee at the meeting of the Barnsley Town Council last Wednesday, Alderman Raley stated that the construction of the Midhope reservoir was progressing satisfactorily; and Mr. Hawksley had decided, on the suggestion of Mr. Taylor, the Water Manager, to construct six filter-beds instead of four. The revenue from the water-works for the past year was £19,613, and the expenditure £11,115—leaving a profit of £8498, or an increase of £1096. In the expenditure was included £1875 paid for water bought. He believed when the works were finished at Midhope, if they retained their profits, they would be able to open the works without having thereby involved any charge on the ratepayers.

The Plumbers' Strike in Sheffield Ended.—After being exactly three months on strike, the plumbers of Sheffield, nearly 300 in number, have now resumed work. The cause of the strike was that the master plumbers refused to grant an unconditional advance of ½d. per hour in the rate of wages. Negotiations had been proceeding for some months, when, on the 31st of December, the men availed themselves of the short notice which is customary in their trade and stopped work a couple of hours after announcing their intention to do so. Negotiations commenced and were carried on at wearisome length. Finally, the men signified their willingness to observe all the masters' "new rules of working," which were one of the main points of contention in the dispute, and they did this notwithstanding that their demand for an increased rate of wages had not been conceded. It is one of the conditions of the settlement, however, that the demand for ½d. per hour extra wages shall go to arbitration by the Board of Trade. Another condition of the settlement is that the master plumbers shall all take back their former workmen.

Fatal Gas Explosion at Sheffield.—On Monday, the 1st inst., a serious gas explosion occurred at the works of Messrs. Walter Latham and Sons, of Sheffield. Three of their men were injured, of whom one—Frederick Maxfield, aged 22 years—died a week later. According to a statement made by the unfortunate man to his father after the accident, he (the deceased), Walter Latham, and Edwin Sheldon went into the strong room to get their work out on the Monday morning. Deceased noticed that there was a strong smell of gas; and he said to Sheldon, "Don't strike a light." Sheldon replied that he could not smell the gas very much. Deceased then said that, if Sheldon was going to strike a light, he was to wait until he got out of the room. Sheldon, however, struck a match immediately afterwards. An explosion occurred, and deceased received the full force of it in his face. At the opening of the inquest on Wednesday, the Coroner said that it would be necessary to adjourn the proceedings for a fortnight, as they must hear the evidence of Sheldon, who was an inmate of the hospital, and was not sufficiently recovered from his injuries to be present. Mr. Latham stated that his son was also still suffering from his injuries; and it would be a week before he could attend the inquest. The Coroner: Will he say that Sheldon struck the light? Mr. Latham: Yes, and Sheldon himself will say so, too.

Increase in Stokers' Wages at Cowes.—The wages of the stokers at the Cowes Gas-Works have been increased by the District Council, on the recommendation of the Gas Committee, by 2s. per week in each class. The men work twelve hours a day and seven days a week.

Municipal Gas Supply at Bale.—The gas-works at Bâle, in Switzerland, have been in the hands of the Municipality since 1868. At that time, the price of gas was 8s. 4d. per 1000 cubic feet; but it has been gradually reduced, until in 1899 it was only 3s. 7½d. During this period, the annual profits increased from £2740 to £15,058, and similar amounts were annually employed in repayment of loans.

River Plate Gas Company.—The profit realized by this Company in the year ending Dec. 31 was £96,669. Adding some miscellaneous receipts and £10,343 brought forward, there is produced a total of £107,945. After payment of all fixed charges, making ample allowance for bad and doubtful debts, and providing for the maintenance of works, mains, &c., there remains to be dealt with the sum of £83,735; and at the annual meeting on Monday next the Directors will recommend that it shall be disposed of as follows: To the reserve fund, £10,000; to writing off discount on the issue of debenture stock, £2000; and to paying a final dividend, making 7 per cent. for the year, tax free, £34,043. The interim dividend absorbed £25,532; and the balance to be carried forward will be £12,160. An installation of carburetted water-gas plant has been put up, and has given great satisfaction. The mains have been lengthened by about 17 miles; and 688 new houses had been connected with the Company's system when the accounts were made up.

Recognition of the Gas Workers' Union Refused at Carlisle.—The Gas Committee of the Carlisle Corporation decline to allow the Gas Workers' Union to intermeddle in affairs between them and their workmen; and in this decision they were supported by the Council. The matter was reported upon by the Committee at the meeting of the Council last Tuesday. They stated that the employees at the gas-works had sought to have an interview with the Committee through Mr. H. Lynas, of the Gas Workers' Union, with reference to their hours of labour and wages; but the Committee had declined to receive Mr. Lynas, and offered to treat with the men through the Manager of the works. The men on their part had declined to accept an invitation to meet the Manager; and so the Committee had decided to take no further action. In a few observations on the matter, Mr. Collin said he regretted that the Committee had refused to receive Mr. Lynas. The old tyrannical methods of dealing with disputes between employers and their workmen had ceased to be up-to-date; and he considered that grievances could be most freely discussed and most satisfactorily removed by recognizing the men's officials, and hearing what they had to say for those who employed them. Mr. French agreed with Mr. Collin, and asked for an explanation of the Committee's conduct. Mr. Corbett, Chairman of the Committee, said they had in times past been able to deal direct with the men in a satisfactory way to both parties; and they really did not see why they could not do so now. As already remarked, the Council approved of the action of the Committee.

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The View of a Warrington Journalist.—"The Corporation Gas Committee are trying the intensified gas-light, which threatens to become so formidable a rival to the electric light. There is a lamp lighted by this new system at the entrance to the Mersey Street gas-works; and a wonderfully brilliant and steady light is produced. Readers who have not seen the light should make a point of seeing it. They will be readily convinced that the electric light is not going to entirely supersede lighting by gas."

Skipton Gas-Works Extensions.—The Skipton District Council are carrying out extensions of the gas-works which they acquired a year ago. The latest project is to convert the ammoniacal liquor into sulphate of ammonia; and, acting upon the advice of their Consulting Engineer (Mr. Robert Porter), the Council have sanctioned the scheme, which, for the remarkably modest investment of £450, is calculated to bring in a return of above £200 per year. The Council have also decided to erect a new governor-house. On the first year's working of the concern under the Council, there is, it is stated, a small profit, notwithstanding the inflated price of coal.

Cromer Gas Company.—At the recent annual general meeting of this Company, the Directors reported that the profits in the twelve months ending Dec. 31 amounted to £1538, against £1194 in 1899. Adding the balance brought forward (£460) made a total of £1998, which was reduced to £1269 by the payment of interest on debentures and temporary loans. Out of this sum the Directors recommended] the declaration of a dividend at the rate of 2½ per cent. per annum; making with the interim dividend 4 per cent. for the year. This would leave a balance of £247, against £462 before. The sale of gas was 13·8 per cent. more last year than in 1899, though the full advantage of the new works had not been experienced. In order to provide for the increasing consumption, the Directors further reported that they had decided, on the advice of their Engineer (Mr. Percy Griffith, Assoc.M.Inst.C.E.), to re-erect the larger of the holders from the old works at the new ones; and they had also instructed him to report on the provision of sulphate of ammonia plant. The report was adopted.

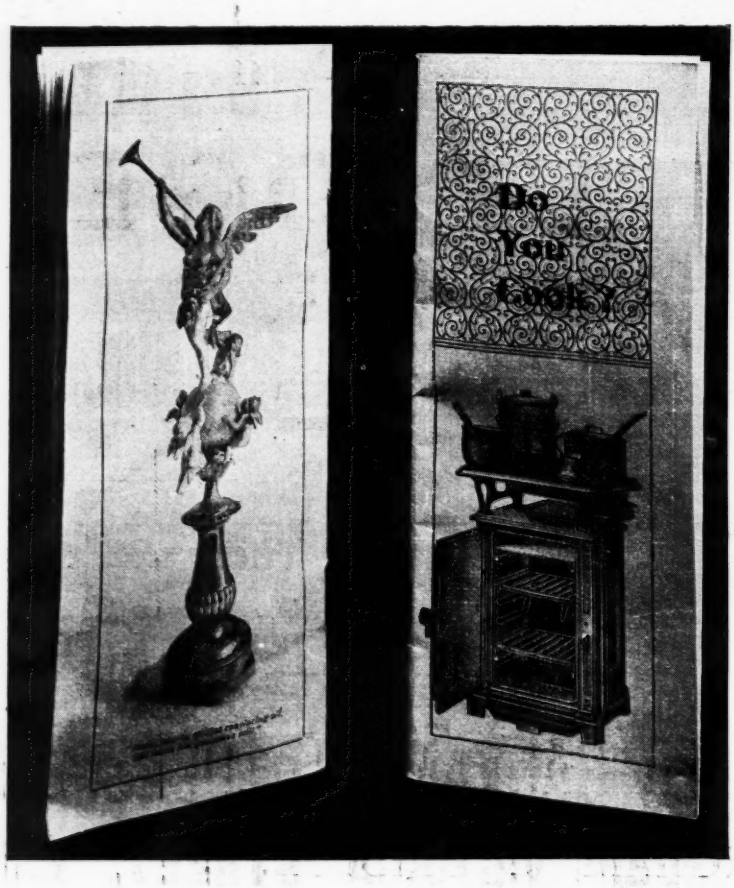
New Water Supply for Goole.—The Gas and Water Committee of the Goole District Council have been informed by the Engineer for the water-works at Pollington (Mr. J. C. Melliss) that the contractor has constructed the new well (80 feet deep and 10 feet in diameter), and made a 20-inch borehole to a depth of 130 feet from the bottom of the well; making a total depth of 210 feet from the surface of the ground to the bottom of the borehole. He has also carried out the test pumping, and during twelve-and-a-half days' continuous work some 8 million gallons of water were lifted from the well and borehole, and throughout there was no diminution in the yield. Careful records have been kept, under the control of Mr. M. Dunn, during the whole time, and gauging of the quantity had been made both by Mr. Dunn and Mr. Melliss. These data show the daily yield of the well and borehole to approach nearly 700,000 gallons in the twenty-four hours, which is ample for the present requirements of Goole and for some time to come, and also for the supply to such adjacent villages as may require water.

Increased Capital for the Andover Gas Company.—A special meeting of the shareholders of the Andover Gas Company has been held, to consider a proposition by the Directors to increase the capital from £8000 to £14,000, in order to extend the works to meet the increased consumption of gas. Mr. F. S. Shaw presided, and explained the difficulty experienced during the winter months to meet the demand with the present plant; while he showed that by issuing the shares as the money was required, there was little chance of the present dividend being adversely affected. The proposal was unanimously agreed to.

St. Anne's Gas Company.—Presiding at the ordinary meeting of this Company, Mr. George Webb stated that the increase in the consumption of gas during last year was above 15 per cent. Considerable extensions had been made, including a new gasholder and the laying of a new trunk main. At the present time, an enlargement of the carbonizing plant to the extent of 50 per cent. was in progress. The price of gas was reduced two years ago by 3d. per 1000 cubic feet; and again on Jan. 1 this year by another 3d.—making the net prices 3s. 9d. for lighting purposes and 3s. 3d. for gas engines and cookers. With continued prosperity, further reductions might be expected. Full dividends on the several classes of shares were declared.

Municipal Hot-Water Supply.—A municipal hot-water pipe, which supplies all the buildings in the town with hot water for heating purposes, has been devised for the city of Chorbusco, Indiana. Large mains have been laid 3 or 4 feet below the ground, and protected by many layers of corrugated paper and wood. Specially constructed boilers have been provided at the central station; and from these hot water is sent to all parts of the city. For the heating of rooms, all that is required is to turn on a tap, when the water flows through the pipes, and in a very short time brings the atmosphere up to the desired temperature. It is said that the system of regulation is so good that the heat can be controlled simply by reducing or increasing the flow of water as occasion may require. Eventually the water finds its way back to the central station, where it is reheated.

Water Supply and Rainfall.—The recent rainfall has had a good effect on the quantity of water put into store in different parts of the country to meet summer requirements. The Manchester supply is a good example. At the meeting of the Corporation Committee on Thursday, it was reported that, from April 1 to 10, the rainfall in the Longdendale watershed had equalled a total depth of 1¾ inches, or a depth of ½ inch greater than the rainfall there in the corresponding period of last year. This downpour has largely augmented the stock of water in the Corporation reservoirs in the Longdendale Valley. These are practically full. Their contents are reckoned at 5153 million gallons, as compared with 4578 million gallons—the estimated stock on April 11, 1900. The quantity in the reservoirs, with the daily additional supply of 10 million gallons from Thirlmere, is said to represent a supply over the Manchester water-works area for 126 days; and the springs are regarded as reliable to still further increase the stock to a supply for 160 days. Much water is just now running to waste at Longdendale; and at Thirlmere, the lake is overflowing the sill.



1901

COOKER

SEASON.

LISTS

NOW READY.

The Wandsworth Fire.—At the Wandsworth Town Hall, on the 6th inst., Mr. Braxton Hicks, the Coroner for the South-Western District, opened an inquiry into the circumstances attending the death of Robert Fisher, which resulted from the fire in the sulphate-house at the Wandsworth and Putney Gas-Works on the 1st inst., as already recorded (*ante*, pp. 906, 952). The proceedings were only formal; and the inquiry was adjourned for a few weeks.

Extensions at the Nuneaton Gas-Works.—Intimation was received at Nuneaton last Friday that the Board of Trade propose to grant, subject to certain modifications and amendments, the Provisional Order to sanction the extension of the works of the Nuneaton Gas Company. The application of the Company was to raise additional capital to the extent of £50,000; but the Inspector who held the inquiry on behalf of the Board of Trade suggested that it should be £40,000 only.

The Gas Question in the Metropolis.—The Gas Consumers' Protection League recently held a general meeting at the Memorial Hall, Farringdon Street, under the presidency of Mr. James Rowlands, when the following resolution was passed unanimously: "That this meeting of the members of the Gas Consumers' Protection League hereby desires to heartily thank the Members of Parliament who took an active part in successfully resisting the attempt of the Gaslight and Coke Company to obtain further statutory powers without complying with the recommendations of the Select Committee of the House of Commons. This meeting further calls upon the Members of Parliament for London to decline to give powers which will enable the Gaslight and Coke Company to sell their district south of the Thames until the existing rights of the Local Authorities are protected, and such reforms as have been recommended by the House of Commons Committee are fully carried out in the interests of the general consumers." Mr. Lough, M.P., said that he had much pleasure in acknowledging the resolution on behalf of his colleagues in the House.

Fatal Explosion at the Brighouse Gas-Works.—Last Friday afternoon, a serious explosion occurred in the new inclined-retort house at the Brighouse Corporation Gas-Works. It appears that a large quantity of gas was allowed to escape in its passage from the retorts to the hydraulic main; and it immediately took fire, and filled the house with flame. No damage was done to the works and plant; but, unfortunately, serious injury was sustained by the foreman (William Owen) and two other men, named Barraclough and Thornton, who, it appears, were on the retort-bench at the time of the occurrence. Owen and Barraclough were badly scalded by boiling tar; and the latter fell, and received a large wound in the head. Medical assistance was immediately summoned, and everything done for the two men until they could be conveyed to the Huddersfield Infirmary, where Owen succumbed to his injuries in the evening, and Barraclough was not expected to recover. The third man, Thornton, who was not so badly burned as the others, was taken to his home. Mr. J. Parkinson, the Gas Engineer to the Corporation, Mr. W. L. Sutcliffe, the Manager, Alderman Sugden, the Chairman, and several members of the Gas Committee, were promptly in attendance, and displayed sympathetic concern for the sufferers.

The Gas-Workers' Union and the General Federation of Trade Unions.—At a special congress of the National Union of Gas Workers and General Labourers, recently held at the head office in London for the purpose of considering the relations of the organization with the National Federation of Trade Unions, it was decided that the Union should continue its affiliation to that body, and further to promote several amendments to the present rules of the Federation, to be brought forward at the next annual meeting, with a view to rectifying certain grievances under which the Union have laboured. These, it may be remembered, led to a resolution last December to sever their connection with the Federation; but the final decision was postponed for three months. The matter has been settled by a majority of two to one.

Sheffield and the Lady Bower Question.—Alderman Gainsford, the Chairman of the Derwent Valley Water Board, has been of late one of the best abused men in Sheffield on account of the position he took up in connection with the question of obtaining stone from the Lady Bower Valley for the Board's reservoirs. On the presentation of the minutes of the Parliamentary Committee at the meeting of the City Council last Wednesday, he was afforded an opportunity of explaining his "conduct." His speech was a long one; but the points on which he laid emphasis were these: First, of all, there was his duty as Chairman of the Board. In this respect he said he was distinct from other representatives of the Council upon the Board. The second reason was his care for the interests of Sheffield in the future, which, he contended, could only be safeguarded by preserving the unanimity of the Board. He still thought the mature judgment of the future would maintain, support, and confirm the policy of the Board. Of course, he was aware that, in making the proposed railway and quarry, it was perfectly possible to destroy all the beauty and the amenities of the district; but his belief was not shaken that it was perfectly possible to do all the work without destroying that beauty. If he had been allowed to carry out his policy and his intentions on the Board, he submitted that in ten or a dozen years time popular judgment would have declared he was right, and that no real harm had been done. A new situation had been created by the decision of the Parliamentary Committee; and the only possible course was that the Board should sit down at once and fairly examine the question again from the beginning. This meant that they must no longer consider that the Lady Bower site was a site prescribed by Parliament for the getting of stone. The site was gone for the moment at any rate. But the Engineer of the Board would have to go round and put before the Board a definite report on all the alternative places he could think of whence stone could be obtained, with comparisons. If this should result in the conclusion that the Lady Bower stone was the right and best stone, he was afraid they would have to go again to Parliament; and they would then be in the position of being able to show necessity. He deeply regretted that for a moment there should have been a difference of opinion between himself and the Council. He had simply done what he had conceived to be right for the interests of Sheffield, and for the future.

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Accident at the Leigh Gas-Works.—A singular accident occurred at the Leigh Corporation Gas-Works late on the night of the 4th inst. The top of a large tar-well collapsed suddenly, and precipitated into the tar three handcarts, a quantity of tiles, and other material. Considerable damage was done. Mr. R. Greenough, the Vice-Chairman of the Gas Committee, Mr. J. Foster, the Engineer and Manager, and eight workmen, who had been standing on the spot just previously, had a fortunate escape.

Burslem Gas Affairs.—At the meeting of the Burslem Town Council last Tuesday, it was decided to erect plant for the manufacture of sulphate of ammonia; and the Gas Manager was instructed to prepare plans and obtain estimates. It was also resolved to borrow £31,000 from the Prudential Assurance Company, to provide for the expenditure on a new gasholder and other extensions and improvements. The loan is to be repayable by twenty-six annual instalments of principal and interest combined.

Cost of the Wentwood Water Scheme for Newport.—In bringing up the report of the Water Committee at the meeting of the Newport County Council last Tuesday, Mr. Goldsworthy, the Deputy-Chairman, stated that the work was progressing satisfactorily at Wentwood; and Mr. Baldwin Latham, the Engineer, had been asked by the Town Clerk to furnish a report as to the probable cost of the completion of the scheme. Mr. Wilkinson pointed out that the amount already expended was £252,468 13s. 4d.; and this was the scheme which gentlemen said was going to cost £94,000.

Fatal Gas Explosion at Haslingden.—An inquiry was held a few days ago into the circumstances attending the death of Ann Illingworth, the landlady of the Bridge Inn, Haslingden, which resulted from burns caused by an explosion of gas which wrecked the premises. Deceased detected a strong smell of gas early in the morning of the 31st ult., and on proceeding with a light to turn off the supply at the meter, the explosion occurred which set the place on fire. Investigation showed a crack in the pipe of the chandelier, which had a few weeks previously been repaired, sufficient to account for an accumulation of gas. The man who did this work said he examined the joints of the chandelier with a light, but did not discover any leakage. He did not, however, try the inner pipe. Mr. J. S. Green, the Superintendent of the Fire Brigade, said he thought the escape of gas was inside the premises; but a Police Inspector stated that a constable had perceived an odour of gas issuing from a wall across the road from the hotel, and on applying a light there was a flame. The Jury returned a verdict of "Accidental death." During the proceedings, it was suggested that the gas which exploded travelled to the house by means of one of two old drains from a main of the Accrington District Gas and Water Board, which was found to have been fractured at a point where the Haslingden Corporation had disturbed the earth to make a new drain. One of the old drains was laid bare in opening the trench to repair the gas-main; but further excavation showed that it ended abruptly a few yards from the trench, which was 20 yards from the inn. The other drain came from the road, and ran along the gable end of the house, close to the seat of the explosion. But smoke tests applied under pressure showed that this drain was completely blocked. These facts justify the conclusion that the leakage occurred in the house.

The Heywood Town Council were informed at their meeting on Thursday that they must not expect anything from the gas undertaking in aid of the rates this year. If, said Mr. Firth, the Committee came out straight, they would do well.

According to a recent telegram from Montreal, the Montreal Heat, Light, and Power Company are organizing an immense Trust for the purpose of monopolizing all the electric power and gas businesses in and about the city. The capital is $25,000,000.

The Metropolitan Water and Sewerage Board Act has been passed by the Legislature of Massachusetts, and was signed by the Governor on the 20th ult. It abolishes the Metropolitan Water Board and the Board of Metropolitan Sewerage Commissioners, and transfers their powers and duties to the new Commission

The Warrington Corporation have accepted the tender of Messrs. J. Simpson and Co., Limited, for the supply of a triple-expansion deep-well pumping-engine, with boilers, economizers, feed-water filter, superheater, and surface condensers, and all accessories and tools, to be erected and finished complete at the Delph Lane pumping-station, at £11,175.

The Barnsley Corporation have accepted the tender of the Stanton Iron-Works Company, Limited, to supply pipes for the water-main from Wortley to Barnsley at prices which worked out to £4 15s. per ton, as against £6 6s. per ton paid on a former contract. The total amount of the contract will be £16,809 15s.—a saving due to the fall in price of about £5000.

The Blackman Ventilating Company, Limited, have acquired from Mr. James Keith his business as a heating engineer (with departments in gas and hydraulic work), carried on at Farringdon Avenue, E.C., and at his foundries and engineering works at Arbroath. The name of the new Company will be the James Keith and Blackman Company, Limited.

The Margate Town Council have decided to temporarily supplement the water supply by a system of sea-water mains from Newgate Gapway to the Parade. The water will be used for road-watering and sewer-flushing purposes derived from stand-posts along the line of route, and will be raised by a gas-engine, and then flow by gravitation to the lower part of the town. The estimated cost is put at £1600.

The Heckmondwike Gas Company have placed a contract with Messrs. R. Dempster and Sons, Limited, of Elland, for a complete installation of inclined retorts, consisting of six arches, each containing settings of eight retorts 20 feet long, heated by regenerator furnaces on the Chester system. The contract includes a stone retort-house and coal elevating and conveying plant, embodying all the latest improvements. A portion of the work has to be ready for next winter.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

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[For Illustrated Advertisement, see April 3, p. 10.]

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WANTED, two Gas Stokers in a small Gas-Works.
Apply to the SECRETARY, Gas-Works, Burnham, SOMERSET.

WANTED, a Draughtsman well up in the Details of Gas Plant.
Apply, by letter, to No. 3675, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Manager's Clerk in a large Gas-Works. Shorthand and Typewriting necessary. Commencing Wages 25s. per week.
Apply, by letter, to No. 3667, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Gas-Works Fitter, competent to do General Fitting, Main and Service Laying, and Rough Smithing. Wages 5s. to 5s. 6d. per day according to Qualifications. Age from 30 to 40.
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WANTED, for the Fowey Gas Works, a COMPETENT MAN, with previous experience of Gas-Works. Manufacture about 3 million Cubic Feet of Gas per annum. House Rent, Rates and Taxes, Gas, and Coal free.
Applications, stating Experience in Applicant's own Handwriting, must be received by the SECRETARY, Fowey Gas Company, Limited, Fowey, Cornwall, not later than Tuesday, the 30th of April inst.

WANTED, by the Aberystwyth Gas Company, for their New Works, a WORKING MANAGER about 30 Years of Age, experienced in the working of Regenerative Furnaces, the Manufacture of Sulphate of Ammonia, &c., and to take charge of the Manufacturing Department. Wages £2 5s. per week inclusive.
Applications, in Candidates' own handwriting, stating Age, with Two recent Testimonials, addressed to the Chairman, Gas Office, Aberystwyth, not later than Friday, the 26th inst.
R. J. JONES,
Secretary.

WANTED, Meter Repairer fully qualified to undertake the repairing and testing of Wet and Dry Meters (Automatic and Ordinary). Wages, 30s. per week.
Apply, giving References, with full Particulars, to
J. E. KENSHOLE,
Manager.
Gas-Works, Merthyr Tydfil,
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WANTED, a thoroughly competent Man as WORKING FOREMAN for Gas-Works making 45 millions. Must be a good Mainlayer, able to take charge of Machinery, and do all Repairs.
Applications, with *copies* of Testimonials, stating Age, Experience, and Wages required, to No. 3674, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C. A Residence is provided on the Works, with Rates, Gas, and Water free.

WANTED, a competent and reliable Man as WORKING MANAGER of a small Gas and Water Works, to have a full knowledge of Gas Manufacture and Gas and Water Distribution, be capable of collecting Gas and Water Rentals, &c.
House, Coal, Gas, and Rates free.
Applicants to state, by letter, Age and Wages required, and enclose *copy* of recent Testimonial, to No. 3673, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SHEFFIELD UNITED GASLIGHT COMPANY.
WORKS SUPERINTENDENT.
WANTED, by the Directors of this Company, an experienced and competent Man to act as SUPERINTENDENT at their Effingham Street Gas-Works. (The position is vacant owing to the present Superintendent having been promoted.) He will be required to reside on the Works, with House and Coal Free.
The Maximum Make of Gas at this Station is about 3½ million cubic feet per day.
Applications (marked "Superintendent"), stating Age, previous Engagements, and Salary required, to be made, by letter only, addressed to Sir Fredk. T. Mappin, Bart., M.P., Chairman of the Company, Gas Offices, Sheffield, not later than Friday, April 26, 1901.
Testimonials not to be sent till asked for.
HARBURY THOMAS,
General Manager and Secretary.
Commercial Street, Sheffield,
April 4, 1901.

URBAN DISTRICT COUNCIL OF TEIGNMOUTH.
APPOINTMENT OF GAS MANAGER.
THE Urban District Council of Teignmouth invite APPLICATIONS for the post of MANAGER of their Gas-Works.
Applicants must be thoroughly competent Men, and have a practical knowledge of the manufacture of Gas, Sulphate of Ammonia, and all Residuals.
The Annual make of Gas is about 24 million cubic feet.
Salary £150 per annum, with House and Gas free.
Applications, stating Age, present or past Employment, giving full Particulars, together with *copies* of three recent Testimonials, to be sent to me, the undersigned, not later than Saturday, the 27th day of April, 1901.
Canvassing will be deemed to be a disqualification.
By order,
A. PERCIVAL DELL,
Clerk to the Council.
Town Hall, Teignmouth,
Devon, April 4, 1901.

WANTED, a Gas-Works on Lease or Purchase, by thoroughly practical Gas Engineer.
Address No. 3665, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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For further Particulars, apply to C. SNELLING, Gas-Works, THETFORD.

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URBAN DISTRICT COUNCIL OF PONTYPRIDD.
(GAS DEPARTMENT.)
TENDERS are invited for the supply of 2000 Tons of GAS COAL, delivered in equal monthly quantities from April, 1901, to July 31, 1901.
Forms of Tender and Specification can be obtained from Mr. Edw. Jones, Gas Engineer, Treforest Gas-Works, Pontypridd.
Tenders to be endorsed "Gas Coal," and sent to the undersigned not later than April 23, 1901.
C. SYDNEY WATSON,
Clerk.
Council Offices, Pontypridd,
April 12, 1901.

BOROUGH OF DARWEN.
(GAS DEPARTMENT.)
TENDERS FOR OXIDE.
THE Corporation are prepared to receive TENDERS for the supply of 250 Tons of OXIDE OF IRON, delivered at their Sidings, for Purifying the Gas at their Works.
All Particulars from, and Samples to be sent to, Mr. A. H. Smith, Gas Engineer, Darwen.
Sealed Tenders, endorsed "Oxide of Iron," to be delivered to the undersigned at or before noon, April 27, 1901.
The lowest or any Tender not necessarily accepted.
By order,
WILLIAM P. HALLIWELL,
Town Clerk.
Town Clerk's Office, Darwen,
April 2, 1901.

BOROUGH OF DARWEN.
(GAS DEPARTMENT.)
SPENT OXIDE.
THE Corporation invite Tenders for the purchase of about 500 Tons of SPENT OXIDE.
All Particulars and Samples may be obtained on application to Mr. A. H. Smith, Gas Engineer, Darwen.
Sealed Tenders, endorsed "Spent Oxide," to be delivered to the undersigned at or before noon, April 27, 1901.
The lowest or any Tender not necessarily accepted.
By order,
WILLIAM P. HALLIWELL,
Town Clerk.
Town Clerk's Office, Darwen,
April 2, 1901.

CITY OF LEEDS.
(GAS DEPARTMENT.)
TENDERS required as below:—
For CAST-IRON PIPES, BENDS, TEES, SYPHON WELLS, and other IRREGULAR PIPES.
For RETORT MOUTHPIECES, STAND-PIPES, DOOR-FRAMES, SPECIAL BENDS, TEES, FLANGE PIPES, SADDLES, BELTS, PLUGS and CAPS, SYPHON COVERS, &c.
Samples may be seen on application at the Stores Department, 21, Dewsbury Road, and Forms of Tender and Specification may be had on application to the undersigned.
Endorsed Tenders, addressed to the Chairman of the Gas Committee, Municipal Buildings, Leeds, will be received not later than Tuesday, the 23rd inst.
The Committee do not bind themselves to accept the lowest or any Tender.
R. H. TOWNSLEY,
General Manager.
Gas Offices, Leeds,
April 10, 1901.

COMMERCIAL GAS COMPANY.
TENDERS FOR COAL.
THE Directors are prepared to receive TENDERS for the supply of 150,000 Tons of clean, dry, unscreened, fresh-wrought GAS COALS, delivered f.o.b. to the Company's Steamers at any suitable Port, during the Year ending the 30th of April, 1902.
The deliveries to be in equal monthly quantities throughout the Year.
Payment in cash monthly.
Parties desiring to Tender for more than One Year must state separately the price and quantity offered for each Year.
Particulars and Forms of Contract may be obtained from the Engineer & General Manager, Mr. H. E. Jones.
The Directors do not bind themselves to accept the lowest or any Tender.
Tenders, sealed and endorsed "Tender for Coals," to be addressed to the Chairman of the Coal Committee, and delivered at the Company's Offices not later than Nine o'clock on the 18th April inst.
Commercial Gas-Works, Stepney, E.

CITY OF CARLISLE.
GELTSDALE WATER SCHEME.
CONTRACT No. 1.
THE Corporation of the City of Carlisle invite TENDERS for the execution of the Works included in this Contract, which comprise the construction of COLLECTING-TANKS; WEIRS; INTAKES; CONDUITS; VALVE, SCREEN, MEASURING, AIR, SCOUR, and other CHAMBERS; RIVER and RAILWAY CROSSINGS; a STORAGE RESERVOIR of about 175 million gallons capacity, formed by an Earthen Embankment 860 feet in length, with a Concrete and Puddle Core 1160 feet in length; with WASTE-WATER WEIR, VALVE TOWER, OUTLET CULVERT, &c.; SCREENING and COLLECTING WELLS; Four FILTERS, each about 10,000 super. feet in area; a STREAM DIVERSION CHANNEL, 1572 yards in length; a SERVICE RESERVOIR, 5 million gallons capacity; 2 miles of STONEWARE PIPE; the laying and jointing of 13 miles of CAST-IRON PIPE, ranging from 20 in. to 16 in. diameter; Two DWELLING-HOUSES and other BUILDINGS; the DIVERSION of a PUBLIC ROAD; the construction of BRIDGES, ACCOMMODATION ROADS, DRAINS, BOUNDARY WALLS, &c.
The Drawings may be seen by appointment with the Engineer, who will also give intending Contractors facilities for inspecting the site of the Works, and furnish all Information that may be required.
Specifications and Bills of Quantities may be obtained on payment of a deposit of £10, which will be refunded after the receipt of a *bonâ-fide* Tender, together with the return of all documents lent for the purpose of making up the Tender.
Sealed Tenders must be delivered to the undersigned, on or before the 25th day of May, 1901.
CHARLES B. NEWTON, M.Inst.C.E.,
Engineer.
Water-Works Engineer's Office,
Victoria Viaduct, Carlisle, April 4, 1901.

THE Town and County of Poole Gas and Coke Company, Limited, invite TENDERS for the purchase and immediate removal from their Works of a SINGLE-LIFT GASHOLDER, 40 ft. diameter, 16 ft. deep, together with the Cast-Iron Tank, Six Columns, &c.

Tenders to be sent to the undersigned by the 29th of April.

The highest or any Tender not necessarily accepted.

WILLIAM DAVIS,
Secretary.

THE Directors of the Camborne Gas Company, Limited, are prepared to receive TENDERS for the supply of 1000 Tons of GAS COAL, to be delivered f.o.b. to the Company's order, between May 1, 1901, and May 1, 1902.

The Coal must be of the best quality from the Pits named.

Tenders should reach the Secretary on or before the 24th inst.

The lowest Tender will not necessarily be accepted.

W. BAILEY,
Secretary.

Dated Camborne, April 12, 1901.

DRIFFIELD URBAN DISTRICT COUNCIL.

PURIFIERS.

THE Gas Committee of the Driffield Urban District Council are prepared to receive TENDERS for the supply and erection of Two 12 feet square PURIFIERS, with Valves and Connections.

Particulars may be obtained from Mr. Henry Tobey, Gas Engineer, Malton.

Tenders to be addressed to me, endorsed "Tender for Purifiers," and sent in on or before the 24th of April, 1901.

The lowest Tender will not necessarily be accepted.

By order.
GEO. B. TONGE,
Clerk to the above Council.

Great Driffield,
April 10, 1901.

ISLE OF THANET GAS COMPANY, MARGATE.

THE Directors of the above Company are prepared to receive TENDERS for the supply of 1000 Tons of good CANNEL COAL. The Cannel is to be delivered by Rail, in lots of 50 or 100 Tons, as required; and the deliveries are to extend over a period of Twelve Months from the date of the Tender being accepted.

Tenders, endorsed "Cannel," and addressed to the Chairman, to be delivered at these Offices, not later than Thursday, April 25, 1901.

Any further Particulars will be given by the Engineer of the Company, Mr. James Dougall.

By order,
THOS. C. FULLER,
Secretary.

The Offices, The Dane,
Margate, April 12, 1901.

CLACTON URBAN DISTRICT COUNCIL.

RETORT-BENCH.

CONTRACT No. 10.

THE above Council are prepared to receive TENDERS for the construction of a SHALLOW REGENERATIVE RETORT-BENCH.

Copies of Specification, Form of Tender, and Drawings may be obtained from the Engineer, Mr. Sydney Francis, Town Hall, Clacton-on-Sea, on payment of One Guinea, which will be returned on receipt of a *bond-fide* Tender.

Sealed Tenders, endorsed "Tender for Retort-Bench," to be delivered to the undersigned not later than Four p.m. on Wednesday, May 1, 1901.

The Council do not bind themselves to accept the lowest or any Tender.

GEO. T. LEWIS,
Clerk.

Town Hall Buildings,
Clacton-on-Sea, April 11, 1901.

SHEFFIELD UNITED GASLIGHT COMPANY.

TO ENGINEERS AND IRONFOUNDERS.

THE Directors of the above Company invite TENDERS for the supply and erection of about 77 Tons of CAST-IRON and STEEL WORK required for the extension of the Coal-Store Roof at their Neepsend Station.

Drawings may be seen, and Specification, with Form of Tender and Bill of Quantities obtained, on application to the Engineer, Mr. J. W. Morrison, at the Company's Offices.

The Directors do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, marked "Coal-Store Roof," must be delivered (by post) not later than the first post on Tuesday, April 30, 1901, addressed to the undersigned.

HANBURY THOMAS,
General Manager and Secretary.

Commercial Street, Sheffield,
April 12, 1901.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

(INCORPORATED BY ACT OF PARLIAMENT.)

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of Proprietors of this Association will be held at the City Terminus Hotel, Cannon Street, London, E.C., on Tuesday, the 7th of May next, at 2.30 p.m. precisely, when a Report will be made to the Proprietors, a Dividend declared for the Half Year ended the 31st of December, 1900, and the usual Ordinary Business of such Meeting transacted.

Notice is Hereby also Given, that the CAPITAL STOCK TRANSFER BOOKS WILL BE CLOSED from the 23rd inst. to the 7th prox., both days inclusive.

The Dividend will be paid on the 14th of May.

By order of the Board,
ROBERT W. WILSON,
Secretary.

21, Austin Friars, London, E.C.,
April 15, 1901.

CONTRACT FOR GAS COALS.

THE Milton-next-Sittingbourne Urban District Council invite TENDERS for the supply and delivery during the Year ending the 2nd of May, 1902, of about 1400 Tons of GAS COALS, to be supplied at such times and in such quantities as the Manager of the Gas-Works shall direct.

Full Information, with Forms of Tender, can be obtained on application to the Manager, Mr. A. Davison, Gas-Works, Milton-next-Sittingbourne.

Sealed Tenders, which must be on the Form supplied, should be addressed to the Chairman of the Milton-next-Sittingbourne Urban District Council, and endorsed "Tender for Gas Coals."

The Tenders should be sent or delivered to me, on or before Monday, the 29th of April, 1901.

The Council do not bind themselves to accept the lowest or any Tender.

By order,
WM. PARHAM,
Clerk.

Milton-next-Sittingbourne,
Kent, April, 1901.

FENTON URBAN DISTRICT COUNCIL.

TAR AND AMMONIACAL LIQUOR.

THE Gas Committee of the above Council invite TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR made at their Works during the Twelve Months commencing the 1st day of July next.

Sealed Tenders to be sent in not later than Saturday, the 20th of April, 1901, addressed to the Chairman, Gas-Works, Fenton, Staffs., and endorsed "Tender for Tar, &c."

The Committee reserve to themselves the right of accepting any Tender for the Tar or Liquor separately.

The Committee do not bind themselves to accept the highest or any Tender.

Further Particulars may be obtained on application to the undersigned.

ROBERT SURTEES,
Engineer and Manager.

Gas-Works, Fenton,
Staffs., April 11, 1901.

BARNSLEY CORPORATION WATER-WORKS.

TO PIPE-LAYING CONTRACTORS.

CONTRACT No. 7.

THE Corporation of Barnsley are prepared to receive TENDERS for the LAYING of about Five Miles of CAST-IRON SOCKET PIPES, 22 inches diameter.

The Drawings may be inspected and Specifications and Forms of Tender may be had on payment of the Sum of Two Guineas (to be returned on receipt of a *bond-fide* Tender), on application at the Office of Messrs. T. & C. Hawksley, Civil Engineers, 30, Great George Street, Westminster, S.W., or at the Office of Mr. J. Henry Taylor, Borough Surveyor, Barnsley, on and after Tuesday, the 16th inst.; and Tenders must be delivered at my Office at or before Ten o'clock, in the morning of Tuesday, the 30th day of April inst.

The Corporation do not pledge themselves to accept the lowest or other Tenders.

HENRY HORSFIELD,
Town Clerk.

Barnsley, April 4, 1901.

NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY.

SALE BY TENDER OF
£34,000 THREE-AND-A-HALF PER CENT.
DEBENTURE STOCK.

MINIMUM PRICE, £100 PER CENT.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER £34,000 of THREE-AND-A HALF PER CENT. DEBENTURE STOCK, to be issued under the Provisions of the Newcastle-upon-Tyne and Gateshead Gas Act 1896.

Particulars and Forms of Tender may be obtained on application to the undersigned, and Tenders must be sent in so as to be received at the Office of the Company not later than Ten a.m. on Tuesday, the 14th of May, 1901.

The Stock will be allotted to the highest bidders; but no Tender will be accepted at a lower price than par.

By order,
THOMAS WADDOM,
Secretary.

Offices: 35, Grainger Street West,
Newcastle-upon-Tyne, April 12, 1901.

BRISTOL WATER-WORKS COMPANY.

SALE OF ORDINARY STOCK.

MESSRS. ALEXANDER, DANIEL & CO. will SELL by AUCTION, at the Bank Auction Mart, Corn Street, Bristol, on Thursday, the 25th of April, 1901, at Two o'clock in the Afternoon,

£15,000
BRISTOL WATER-WORKS
SEVEN PER CENT. MAXIMUM
CONSOLIDATED ORDINARY STOCK,
in Lots of £100.

The above £15,000 Stock is part of the 7 per cent. Maximum Consolidated Ordinary Stock, amounting to £690,000, created under the powers of the Bristol Water-Works Acts, 1888, 1889, and 1895.

The Dividend is subject to proportionate diminution whenever the Maximum Dividend to which each class of Ordinary Share or Ordinary Stock of the Company is entitled shall not be paid in full, but such diminution may be made up in subsequent Years.

For further Particulars and Conditions of Sale apply to the Auctioneers, Bank Chambers, Corn Street, Bristol (and 3, Gracechurch Street, London, E.C.); to Fussell and Co., Solicitors, 36, Corn Street, Bristol; or to

ALFRED J. ALEXANDER,
Secretary and General Manager.

Bristol Water-Works Office,
Small Street, Bristol.

HARTLEPOOL GAS AND WATER COMPANY.

IMPORTANT SALE OF GAS AND WATER STOCK.

TO BE SOLD by Auction, at the Company's Offices, Middleton Road, West Hartlepool, on Thursday, the 25th of April, 1901, at 3.15 p.m., precisely,

J. W. CROSBY, AUCTIONEER,

£10,000
OF HARTLEPOOL GAS AND WATER COMPANY'S
FIVE PER CENT. MAXIMUM ORDINARY STOCK,
as follows, namely:—

£5000 (Nominal) of the NEW STOCK (Maximum Dividend 5 per cent.) authorized to be created and issued under the powers contained in the Company's Act, 1898.

£5000 (Nominal) of the NEW STOCK (Maximum Dividend 5 per cent.) authorized to be created and issued under the powers contained in the Company's Act, 1900.

The above Stock will be entitled to Dividend from the 23rd day of May next, if then fully paid up, and will be registered in the name of the purchaser without charge.

A Deposit of 10 per cent. will be required to be paid at the time of Sale, and the remainder on or before the said 23rd day of May.

The Stock will be offered in Lots of £100 each.

By order of the Directors,
W. SCOTT,
Secretary.

Hartlepool Gas and Water Company's Office,
West Hartlepool, March 25, 1901.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
LEA BRIDGE DISTRICT GAS COMPANY.

NEW ISSUE OF £8900 FOUR PER CENT.
PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 30, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

Price 6s., Cloth Bound,

THE CHEMISTRY OF ILLUMINATING GAS.

By N. H. HUMPHRYS, Assoc.M.Inst.C.E., F.C.S.

LONDON:
WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

HEATHCOTE GAS COAL.

Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.,
CHESTERFIELD.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH N.B.

COKE-BREAKERS,

PRICES REDUCED.

(THOMAS & SOMERVILLE'S PATENT)

With Elevators and Conveyors worked by Steam or Gas Engine.

GEORGE WALLER & CO.,

165, QUEEN VICTORIA STREET, E.C.;

And at STROUD, GLOUCESTERSHIRE.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.

LONDON OFFICE:

90, CANNON STREET, E.C.

HOLMSIDE GAS COALS.

Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton . . . 11,205 Cubic Feet.
Illuminating Power 16$\frac{7}{10}$ Stand. Sperm. Candl.
Coke (of good & pure quality) 13$\frac{3}{4}$ Cwt. per Ton.
Sulphur . . . . . A little over 1 per Cent.
Ash . . . . . Under 1 per Cent.
Tar . . . . . 163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor 103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

Present Daily Produce available 3000 Tons.

Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.

Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,

HOLMSIDE & SOUTH MOOR OFFICES,

NEWCASTLE-UPON-TYNE.

THOMAS DUXBURY & CO.,

16, DEANSGATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

FOR SALE, EXCEPTIONAL BARGAIN IN SECOND-HAND

ANNULAR CONDENSERS

as per Illustration below.

In perfect Order and Condition.
Complete with 16-inch Valves and Connections.
Diagonal Tubes dispensed with if desired.

Cheap, less than Half New Price accepted.

J. FIRTH BLAKELEY & CO.,

THORNHILL, DEWSBURY.

Inspection Invited. Photo, &c., on application.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL CO., LD.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by
Messrs. J. & H. S. PATTINSON.

Yield of Gas per Ton . . 10,500 Cub. Ft.
Illuminating Power . . . 16·9 Candles.
Coke (of good quality) . . 67·5 per Cent.
Sulphur . . . . . 0·58 „
Ash . . . . . 2·73 „

For Price, &c., apply to the

WEARDALE STEEL, COAL, & COKE COMPANY, Ltd.,

QUAYSIDE, NEWCASTLE-ON-TYNE.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY,

Strongly recommended where EXCESSIVE HEATS have to be maintained.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE

BOGHEAD CANNEL.

Yield of Gas per ton . . . . 13,155 cub. ft.
Illuminating Power . . . . 38·22 candles.
Coke per ton . . . . . 1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton . . . . 10.500 cub. ft.
Illuminating Power . . . . 17·8 candles.
Coke . . . . . 70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton . . . . 10.500 cub. ft.
Illuminating Power . . . . 16·3 candles.
Coke . . . . . 73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE, SON, & HUNTER,

COAL OWNERS, NEWCASTLE-ON-TYNE

OR

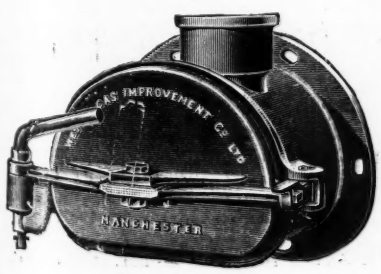
E. FOSTER & CO.,

21, JOHN STREET, ADELPHI, LONDON, W.C.

WEST'S GAS IMPROVEMENT COMPANY, LTD.

ALBION IRON-WORKS, MILES PLATTING, MANCHESTER;

AND 104, QUEEN VICTORIA STREET, LONDON, E.C.



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CHARGING AND DRAWING GAS-RETORTS.

WEST'S PATENT REGENERATOR SETTINGS.

WEST'S PATENT SILENT COKE CONVEYOR.

RETORT MOUTHPIECES WITH SELF-SEALING LIDS.

HARRIS & PEARSON,

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MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.

GLAZED BRICKS AND PORCELAIN BATHS.

THE DELLWIK-FLEISCHER WATER-GAS PROCESS

For Increasing the Capacity of Coal-Gas Works, also for Incandescent Lighting, Driving of Gas-Engines, and Manufacturing Purposes.

(PATENTS IN ALL COUNTRIES)

Plants contracted for within the last Eighteen Months for the following Gas-Works: WEST BROMWICH, KÖNIGSBERG, ISERLOHN, LYONS, ERFURT, REMSCHEID, PFORTSHEIM, PLAUEN, BARMEN-RITTERSHAUSEN, NUREMBERG, BRUMMEN,* OSTERFELD,* WARSTEIN,* WIBORG.*

[* Blue Water Gas with Incandescent Burners.]

ALSO TWENTY-SEVEN INSTALLATIONS FOR MANUFACTURING PURPOSES.

THE DELLWIK-FLEISCHER WATER-GAS SYNDICATE,

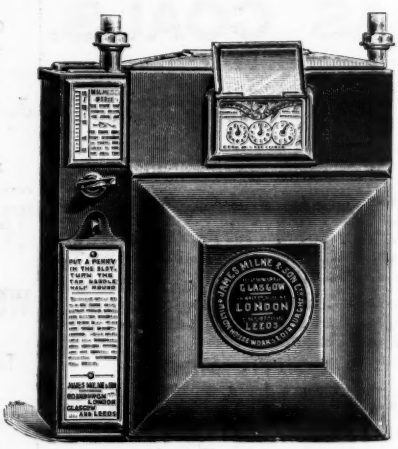
25, VICTORIA STREET, WESTMINSTER, LONDON, S.W.

Milne's New Patent Prepayment Meter.

DOUBLE VALVE ensuring certainty in closing off without strain on any part of Meter.

Most compact Attachment in the Market.

The whole of the Prepayment Mechanism is fixed outside the Ordinary Meter; the connection being made with a Shaft revolving in a Stuffing-Box.



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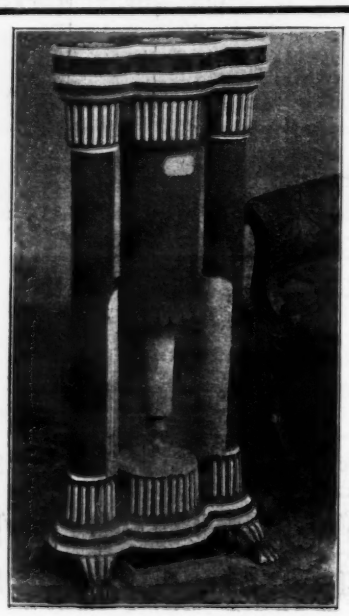

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RITCHIE'S PATENT.

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Contractors for Automatic Supplies to the Gaslight and Coke Company and the South Metropolitan Gas Company,

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ESTABLISHED 1873.

Contractors to H.M. Government.

RETORT-SETTINGS

INCLINED, REGENERATIVE, GENERATIVE, AND FLOOR LINE.

SEVERAL THOUSANDS OF OUR SETTINGS IN SUCCESSFUL WORK.

Plans, Estimates, and full Particulars for Complete or Partial Erection and Renewal.

J. & H. ROBUS,

Engineering Contractors for Gas and Water Works,

20, BUCKLERSBURY, LONDON, E.C.,

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GASHOLDER
TANKS.
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MAIN LAYING.
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S. S. STOTT & CO.,

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COAL AND COKE ELEVATORS & CONVEYORS.

COAL AND COKE STORAGE PLANTS.

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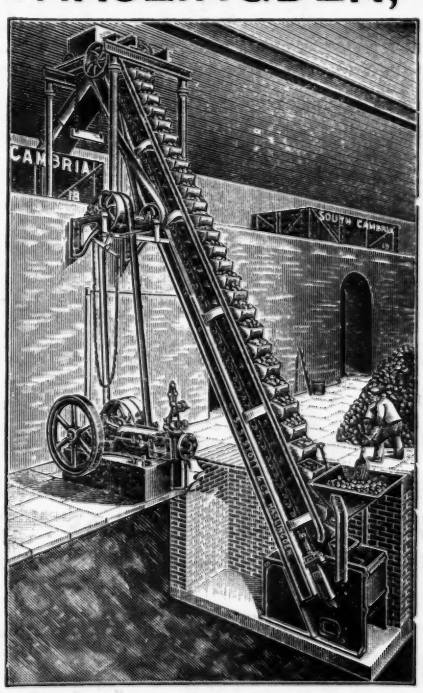
ELEVATORS & CONVEYORS for BOILER-HOUSES.

STAMPED AND RIVETED STEEL ELEVATOR BUCKETS.

DETACHABLE CHAINS AND SPROCKET WHEELS.



LIME AND OXIDE ELEVATORS & CONVEYORS.

HIGH-CLASS STEAM-ENGINES up to 1000-Horse Power.

PUMPS, HORIZONTAL AND VERTICAL, SINGLE, DOUBLE, or THREE-THROW, for WATER-WORKS, &c.

BEAM PUMPING-ENGINES.

AIR-COMPRESSORS.

BELT PULLEYS, ROPE PULLEYS, GEARING, &c., &c.

Coke Elevator Loading Railway Waggons.

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

Midland and West of England District Office: 6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.
Telegraphic Address: "WIGAN, BIRMINGHAM." Telephone No. 200.

London District Office: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents
Telegraphic Address: "PARKER, LONDON."

JOSEPH EVANS & SONS, CULWELL WORKS, WOLVERHAMPTON.

Telegrams: "EVANS, WOLVERHAMPTON." PLEASE APPLY FOR CATALOGUE No. 8. National Telephone No. 7089.

12,000 PUMPS IN STOCK AND PROGRESS.

TRADE MARK.

NO TAPPETS.

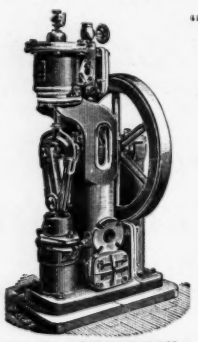


Fig. 703. "SINGLE RAM" STEAM-PUMP.

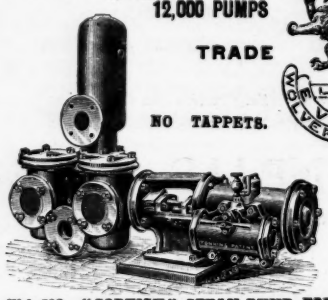


Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

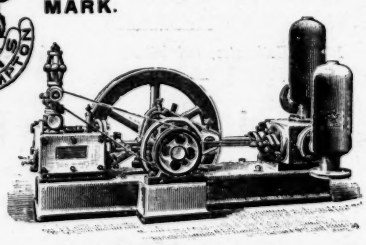


Fig. 688. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

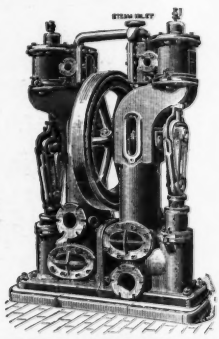


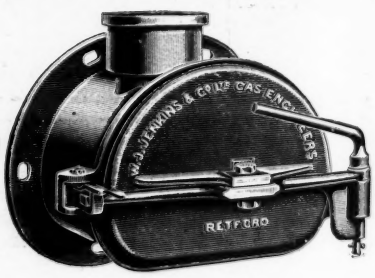
Fig. 713. "DOUBLE-RAM" STEAM-PUMP.

MOUTHPIECES

WITH SELF-SEALING LIDS FOR HORIZONTAL AND INCLINED RETORTS.

SOLE MAKERS OF

THE "DE BROUWER" PATENT COKE-CONVEYOR.



W. J. JENKINS & CO., LTD., RETFORD.

JONAS DRAKE & SON,

OVENDEN, HALIFAX,

HAVE ERECTED **500** OF THEIR PATENT

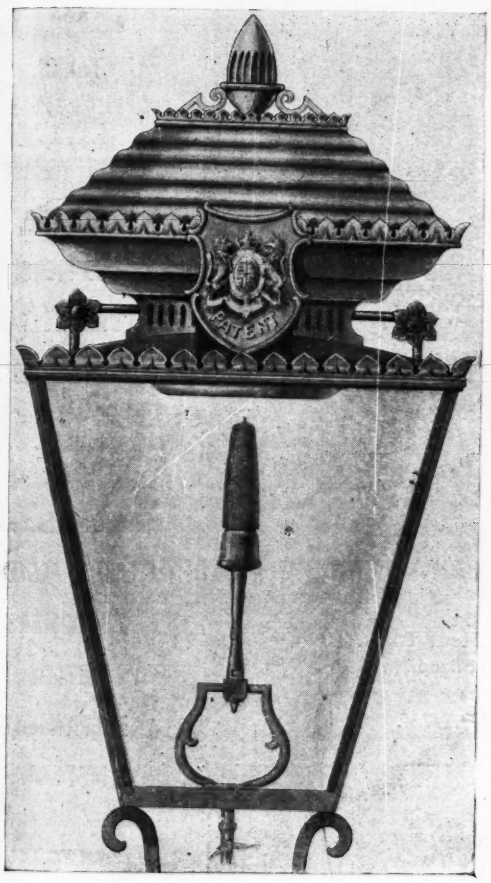
TUBE REGENERATOR

FURNACES DURING THE LAST **4** YEARS.

ESTIMATES ON APPLICATION.

Telephone No. 43. HALIFAX EXCHANGE. | LONDON OFFICE: **34, VICTORIA ST., S.W.** | Telegraphic Address: "DRAKESON HALIFAX."

SCOTT-SNELL
SELF-INTENSIFYING LAMP.



SIZE NORMAL.

Automatic Action.

No Complex Mechanism.

"Power" Free of Cost.

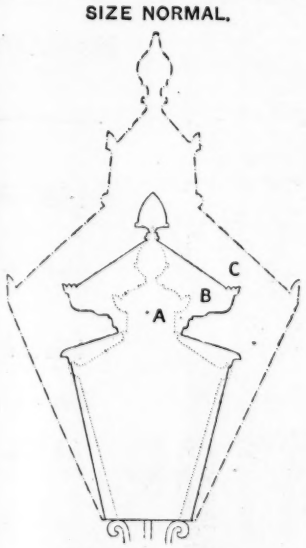
INTENSIFIED LIGHT

WITHOUT Compressing Plant, Special Gas-Service, Water Bill, Gas-Engine or other Pumping Appliances, tearing up of Roadways, or interference with existing Service.

The **SCOTT-SNELL LAMP** may be set to give any pressure from **4** inches to **36** inches of Water; **8** inches to **10** inches is usually preferred.

400-CANDLE POWER OBTAINED FROM A SINGLE BURNER.

Lanterns supplied with Single, Duplex, or Cluster of Burners.



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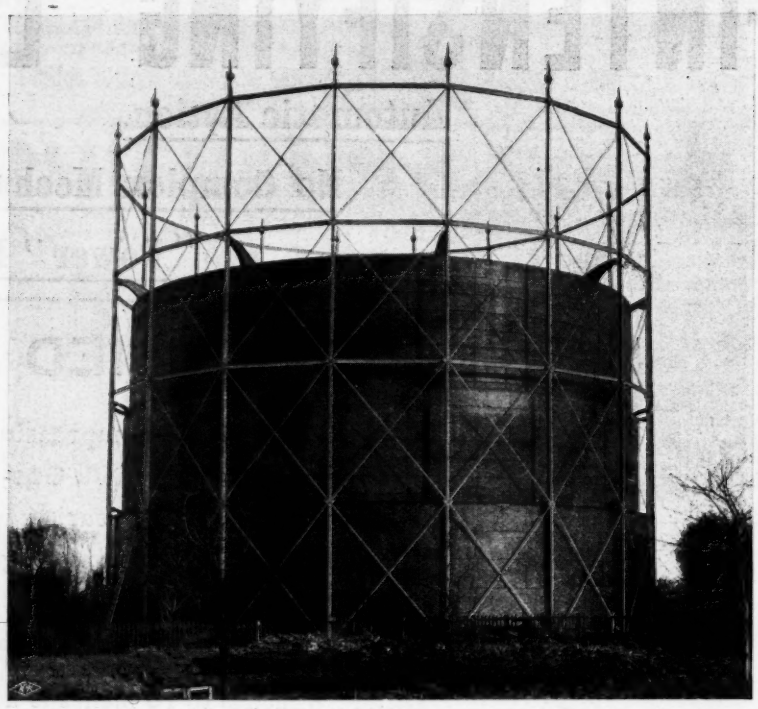

Three-Lift Gasholder and Steel Tank.
90 feet diameter by 20 feet deep.
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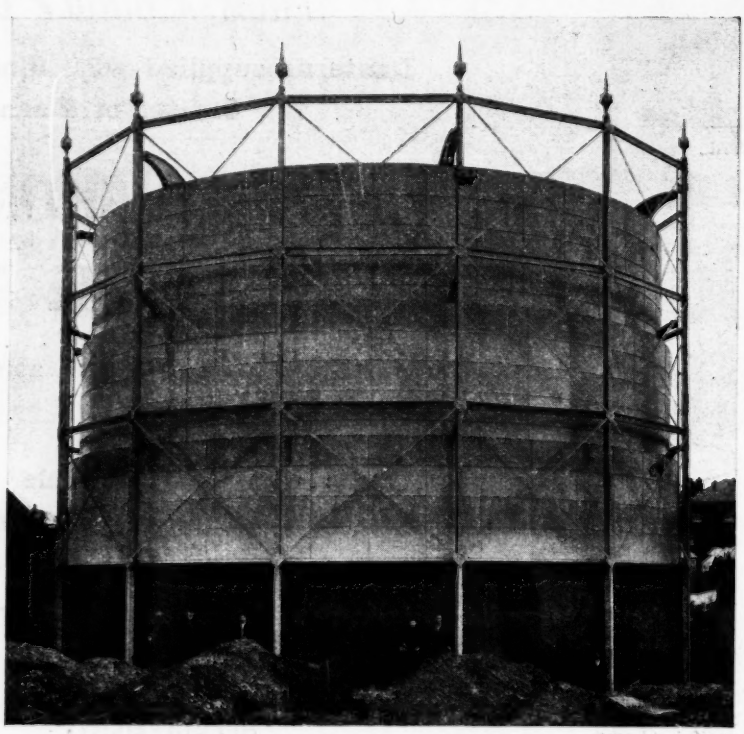

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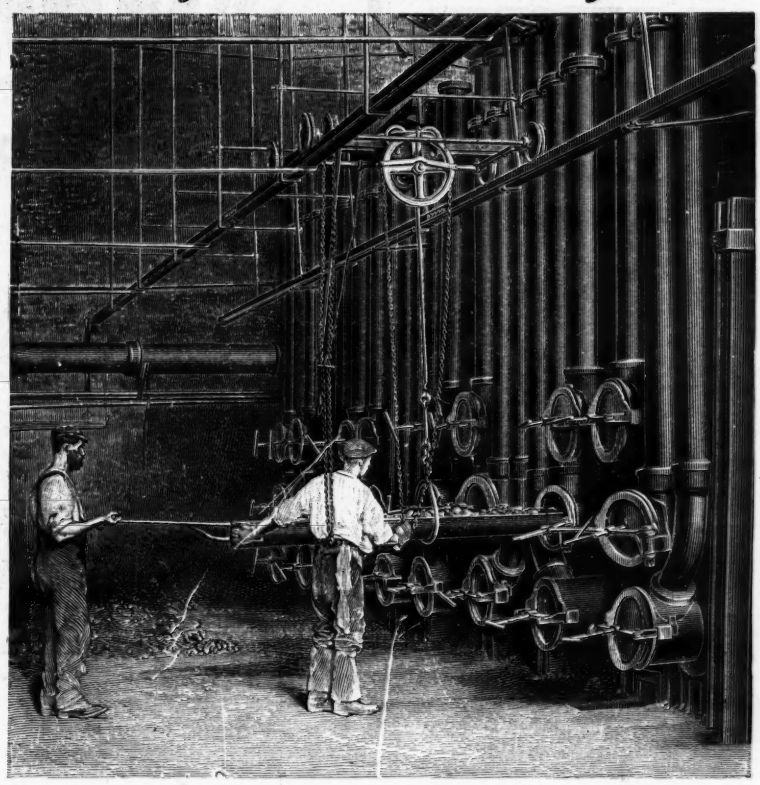

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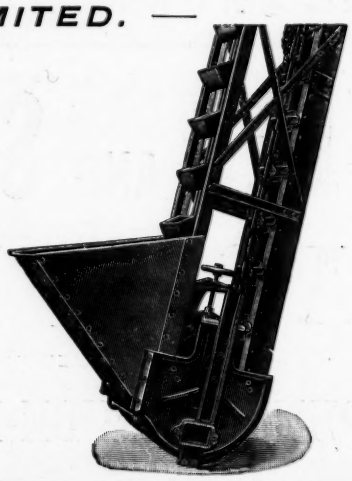

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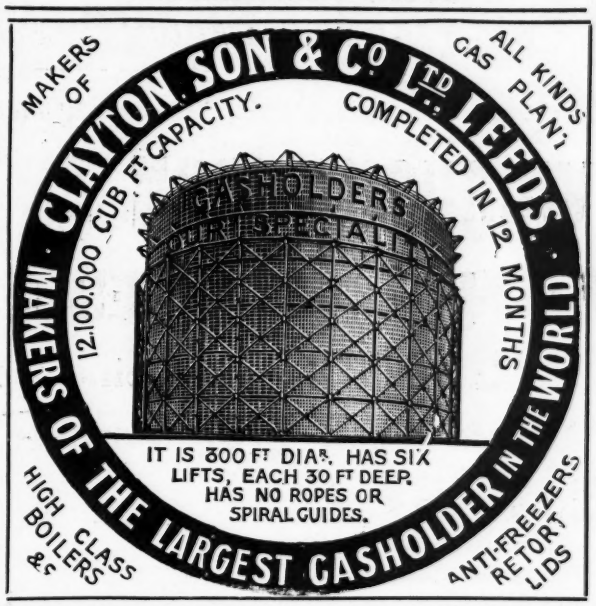
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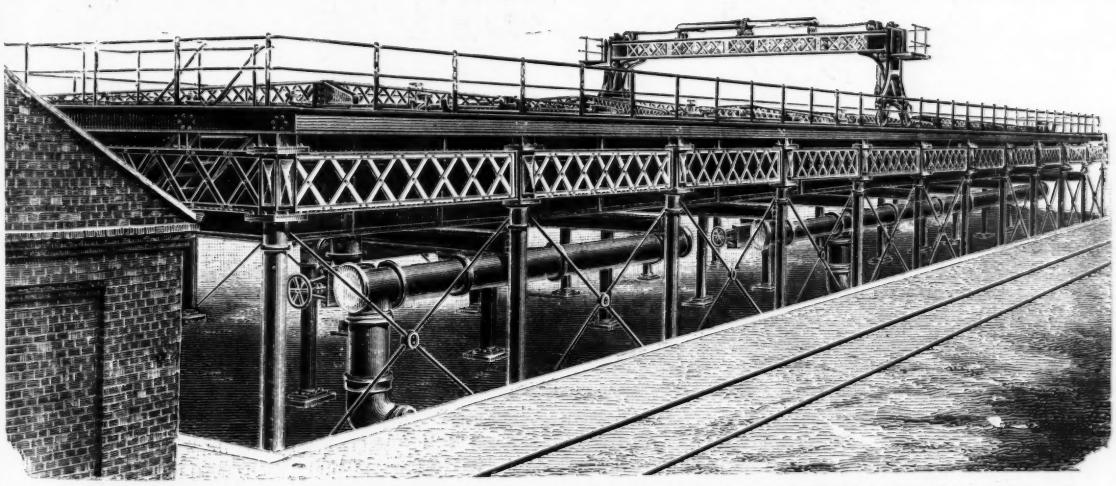

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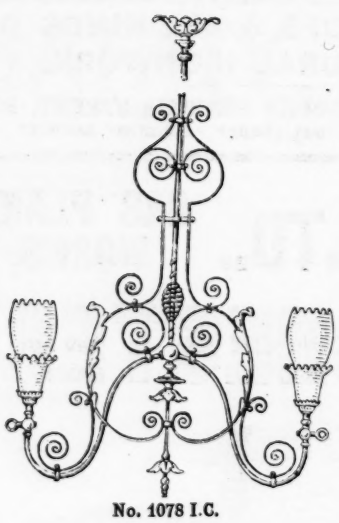

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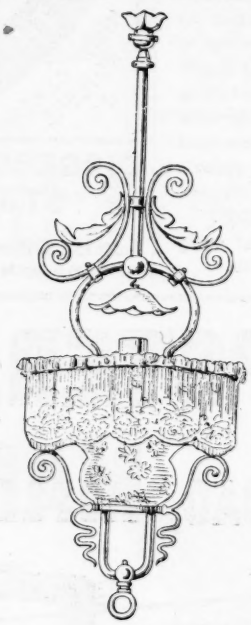

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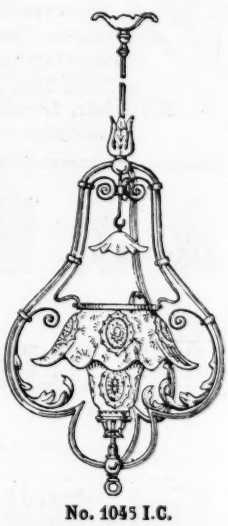

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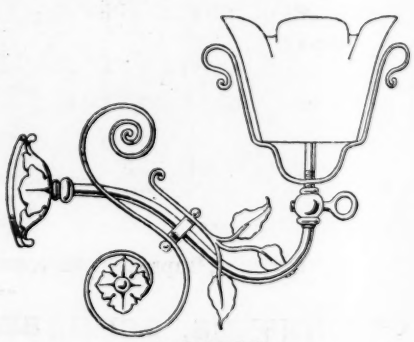
No. 1055 I.C.

No. 1111 I.C.



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